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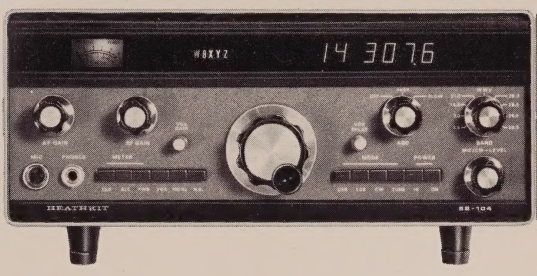
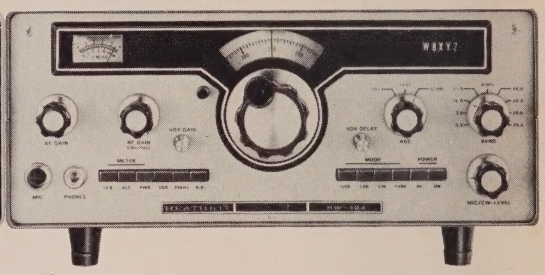


Heathkit HW-104



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AM-327

TS-520 Specifications

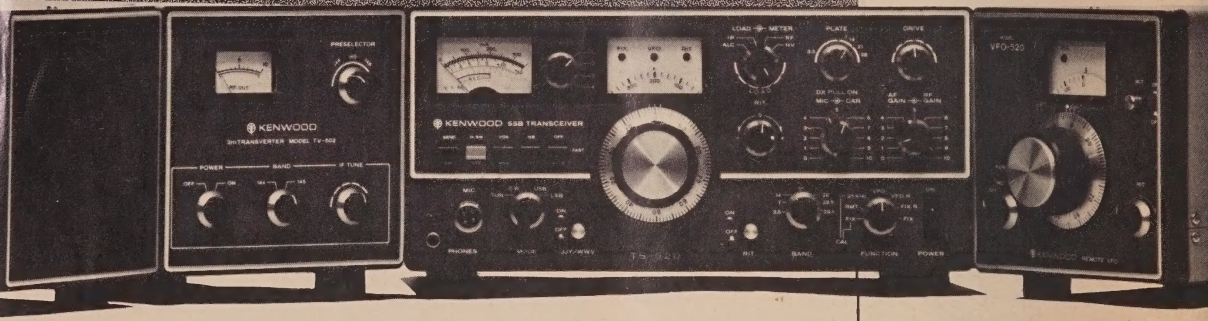
MODES: USB, LSB, CW
POWER: 250 watts PEP input on SSB, 160 watts DC input on CW
ANTENNA IMPEDANCE: 50-75 Ohms, unbalanced
CARRIER SUPPRESSION: Better than −45 dB
UNWANTED SIDEBAND SUPPRESSION: Better than −40 dB
HARMONIC RADIATION: Better than −40 dB
AF RESPONSE: 400 to 2600 Hz (−6 dB)
AUDIO INPUT SENSITIVITY: 0.25μV for 10 dB (S+N)/N
SELECTIVITY: SSB 2.4 kHz (−6 dB), 4.4 kHz (−60 dB). CW 0.5 kHz (−6 dB), 1.5 kHz (−60 dB) (with accessory filter)
FREQUENCY STABILITY: 100 Hz per 30 minutes after warmup
IMAGE RATIO: Better than 50 dB
IF REJECTION: Better than 50 dB
TUBE & SEMICONDUCTOR COMPLEMENT: 3 tubes (2 x 6146B, 12BY7A), 1 IC, 18 FET, 44 transistors, 84 diodes
DIMENSIONS: 13.1" W x 5.9" H x 13.2" D
WEIGHT: 35.2 lbs.
SUGGESTED PRICE: $629.00

VFO-520

Provides high stability with precision gearing. Function switch provides any combination with the TS-520. Both are equipped with VFO indicators showing at a glance which VFO is being used. Connects with a single cable and obtains its power from the TS-520. Suggested price: $115.00.

SP-520

Although the TS-520 has a built-in speaker, the addition of the SP-520 provides improved tonal quality. A perfect match in both design and performance. Suggested price: $22.95.



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INPUT/OUTPUT IF FREQUENCY: 28.0-29.7 MHz
TYPE OF EMISSION: SSB (A3J), CW (A1)
RATED OUTPUT: 8W (AC operation)
ANTENNA INPUT/OUTPUT IMPEDANCE: 50Ω
UNWANTED RADIATION: Better than −60 dB
RECEIVING SENSITIVITY: Better than 1μV at S/N 10 dB
IMAGE RATIO: More than 60 dB
IF REJECTION: More than 60 dB
FREQUENCY STABILITY: Less than ±2.5 kHz during 1-60 min after power switch is ON and within 150 Hz (per 30 min) thereafter.
POWER CONSUMPTION: AC 220/120V, Transmission 50W max., Reception 12W max. DC 13.8V, Transmission 2A max., Reception 0.4A max.
POWER REQUIREMENT: AC 220/120V, DC 12-16V (standard voltage 13.8V)
SEMI-CONDUCTOR: FET 5, Transistor 15, Diode 10.
DIMENSIONS: 6¾" W x 6" H x 13¼" D
WEIGHT: 11.5 lbs.
SUGGESTED PRICE: $249.00

CW-520
500 Hz CW Crystal Filter: $45.00

Prices subject to change without notice

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The Radio Amateur's Journal

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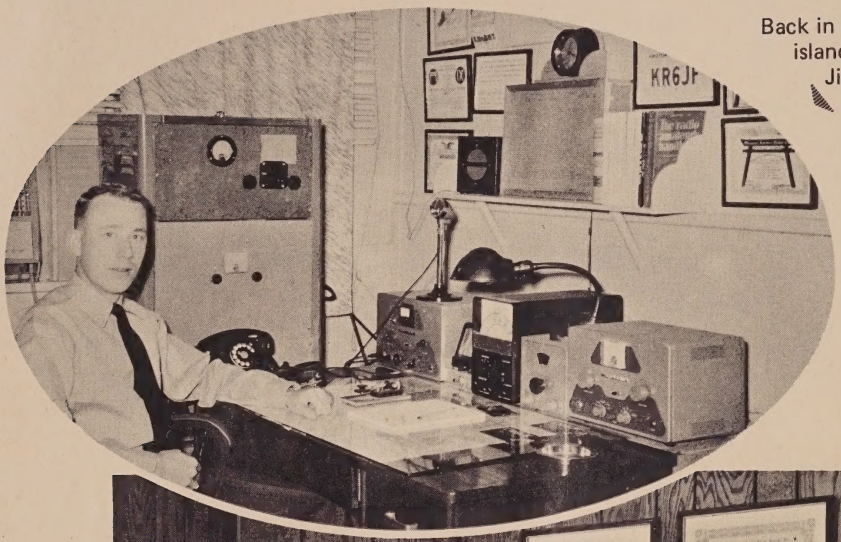
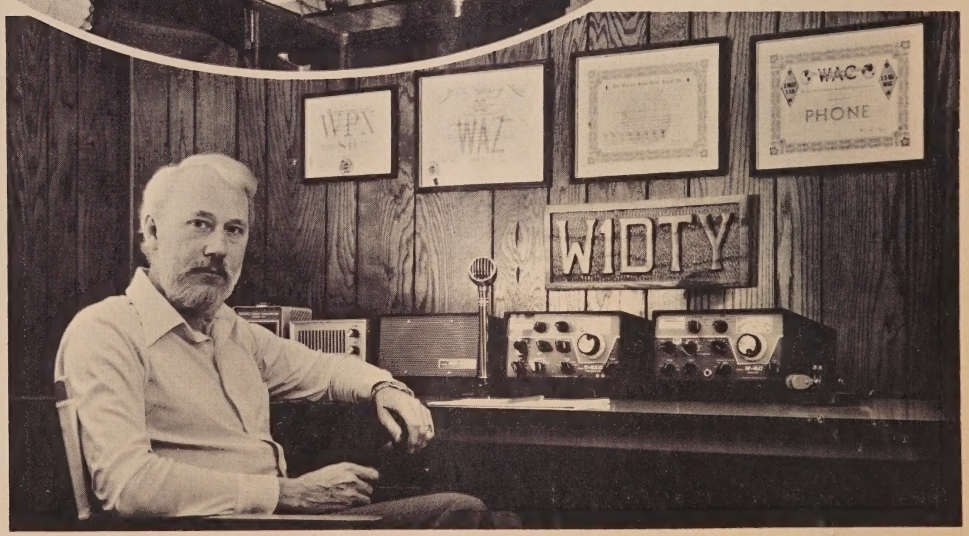


Back in 1958, on the island of Okinawa, Jim Fisk, KR6JF, was operating his Drake Model 1A Receiver.

Today, Jim Fisk, W1DTY, is operating his Drake C-Line station at home in New Hampshire.



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Zero Bias

Elsewhere in this issue, in a letter to the editor, you may notice a reference by a reader to the ARRL being our "favorite nit-pickee." The phrase has a rather nice ring to it and has given us cause to ponder our feelings towards ARRL.

Most certainly, over the years, ARRL has been a target of more editorial comment by *CQ* than has any other person, persons or events. It is for this reason that we often sustain criticism as being anti-ARRL.

The fact of the matter is that we are neither "for" nor "against" ARRL. What we are "for" is the welfare of Amateur Radio; what we are "against" are things which we feel are detrimental to our hobby. Now let's be sure to draw a clear distinction between our hobby, Amateur Radio, and our League. (Yes, our League. I am a member, and have been for most of my Amateur career.) The two are not synonymous despite the implication to the contrary. Amateur Radio pre-dates the ARRL, and while the League has been instrumental in the continuance of Amateur Radio at times in the pre-World War II era, I believe that certainly since about the '30's Amateur Radio has been responsible for its own continued existance, ARRL not withstanding. The service and creative diversion which Amateur Radio provides have themselves justified our occupancy of sizeable portions of the radio frequency spectrum. If this were not so, all the ARRL's in creation could not rationalize our continued existance to the FCC, let alone before the world forum. My point here is that while ARRL has helped Amateur Radio in some ways to continue as an internationally-recognized hobby, it has been no more instrumental in this continuance than has the American Automobile Association been instrumental in the continuance of automobile driving. No, the modern history of Amateur Radio needs to be rewritten to show that the ARRL has flourished because of Amateur Radio, not the other way around.

I am continually irritated by the arrogance of ARRL, but at the same time I'm continually thankful for the existance of a well-funded organization of Amateurs which is capable of doing great things for its membership. Arrogance is an excusable vice. It is more easily excusable when those who are arrogant are also competently serving our needs. We are told that ARRL is a representative democracy, which it might actually be. But as we've seen these past several years in the government of the United States, a representative democracy is not without its failings. In our own ARRL, we do have the right to elect our representatives: our Directors and Vice Directors. We are denied, however, the right to select by ballot, the people who hold far more important roles in ARRL: the Headquarters Staff. Who selects the Headquarters staff in Newington? I know I've never been privileged to vote on a General Manager or Secretary. I've never been given an opportunity to do something about that quagmire of arbitrary nonsense, the DXCC countries list criteria, or DXCC's administration. I've never heard of an ARRL member being able to say, "I don't like the so and so editing *QST*. Let's dump him." No, ARRL exists in two separate worlds. One is the world out here where we vote on directors who send us a letter every so often re-stating the party line, and where we yawn over *QST* once a month. The other is the ARRL at 225 Main Street in Newington, Connecticut which for all practical purposes exists by devine right, and does what it pleases, the public be damned.

I can hear the furious howls. "He's doing it again. He's attacking *our* League!" As Ann Landers so quaintly puts it, wake up and smell the coffee. It's not really your League and it hasn't been for forty years. The real ARRL belongs to Headquarters, and you're picking up the tab.

Do you want your League back? Do you want it to work for you rather than itself? Then start asking questions. And start demanding that your League do more than publish a magazine and books. Wayne Green in his amazingly-early March *73* editorial suggests a $100,000 Amateur Radio PR effort financed by ARRL. Gads, Wayne, are you mellowing that much? $100,000 worth of PR is whistling into the wind. Amateur Radio in the US is worth more than a paultry hundred grand. If ever there was a time to crack open the ARRL's $893,555 piggy bank and invest in our hobby, that time is now.

73, Dick, K2MGA

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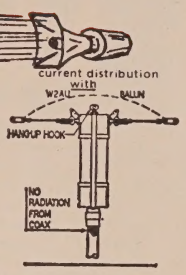

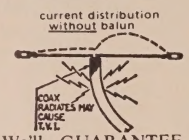

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Our Readers Say

Conventions

Editor, *CQ*:

In response to your editorial in the November issue of *CQ*, I say — Right On!

Some of the people who run the ARRL dominated affairs are the most arrogant, self-rightious b-----ds on the face of this earth! No wonder there are so few coming into Ham Radio from the ranks of CB'ers or anywhere else.

Dick Kelly, W6BKY
Palo Alto, CA

Editor, *CQ*:

Regarding your remarks in November *CQ* on the subject of ARRL Conventions you certainly do hear a second.

I think the main reason we go to such events is to meet other hams, exchange experiences and renew old acquaintances. The Hamfest is the ideal vehicle for this. A modest admission charge, which could include an adequate buffet lunch or dinner and a few door prizes is always possible, if the members of the sponsering organization get it together.

Wayne Hale, WA6LCW
Berkeley CA

Editor, *CQ*:

Thank you for the kind words about the Rochester show in your November Zero Bias column.

A little back patting is in order for myself. The folks at Hamburg (Buffalo) studied the Rochester show carefully and patterned their show after Rochester. The only thing I cannot understand is it's name. Who ever heard of Hamburg — — except McDonald's. Why not call it Buffalo or something that people can identify. The Rochester show is actually held in Henrietta, NY. There is no way we will call it the Henrietta Hamfest.

Speaking of names, the Rochester show will indeed become an official ARRL New York State Convention this year. Nothing changes at the Fairgrounds. Still the same giant flea market with an additional selling area indoors for those who will choose. The same exhibit area under the Dome for the commercial exhibitors and still no competition for programming. The only change will be that the banquet will move from the Fairgrounds to the hotel and we will include a Wouff Houng ceremony. There will also be Sunday morning programming at the hotel. So, we can take care of those who are short on cash and want to look over the flea market and exhibits and also take care of those who have "pulled up the ladder" and attend a lovely affair.

Harold C. Smith, WA2KND
Rochester, NY

Editor,*CQ*:

Read your Editorial re: ARRL Convention — and agree it certainly isn't the place for a novice or one with a limited budget. I wouldn't have attended if I didn't stay with my brother-in-law who lives nearby — and had other things to do. Thanks for the Rochester Hamfest

(continued on page 68)

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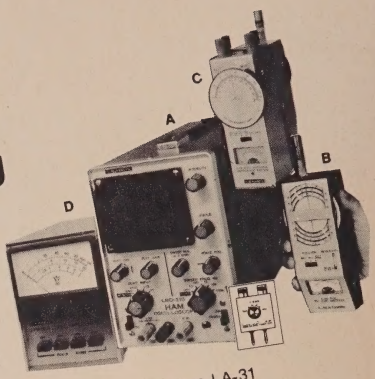

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Amperex has what it takes to be Number One in RF Power Semiconductors...

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Yes, we are still going all out to support our state-of-the-art line with a state-of-the-art program of applications engineering assistance.

Today, there's an Amperex RF power transistor for virtually every fixed or mobile transmitter application from 1.6 MHz to 2300 MHz, from ¼ watt to 150 watts, in 25 different packages and operating at any standard voltage from 6V to 50V.

As new RF transistors are added to our product line, we publish supplements that keep the application manual right up to date. But the engineering assistance doesn't end with the manual—it only starts there. You won't even have to build the prototypes to get these circuits into production! We will supply sample boards, built for you, here in the Amperex applications laboratory. Use them to test, to evaluate, to demonstrate your system. Typical of the sample boards now being made available to Amperex customers is a 100 watt, 1.6 to 18 MHz, 12.5 volt Marine Radio Amplifier (illustrated below).

For more information... on the line, the book, the boards, contact Marty Burden, Group Product Manager, Amperex Electronic Corporation, Hicksville Division, Hicksville, N.Y. 11802. Tel. 516-931-6200.

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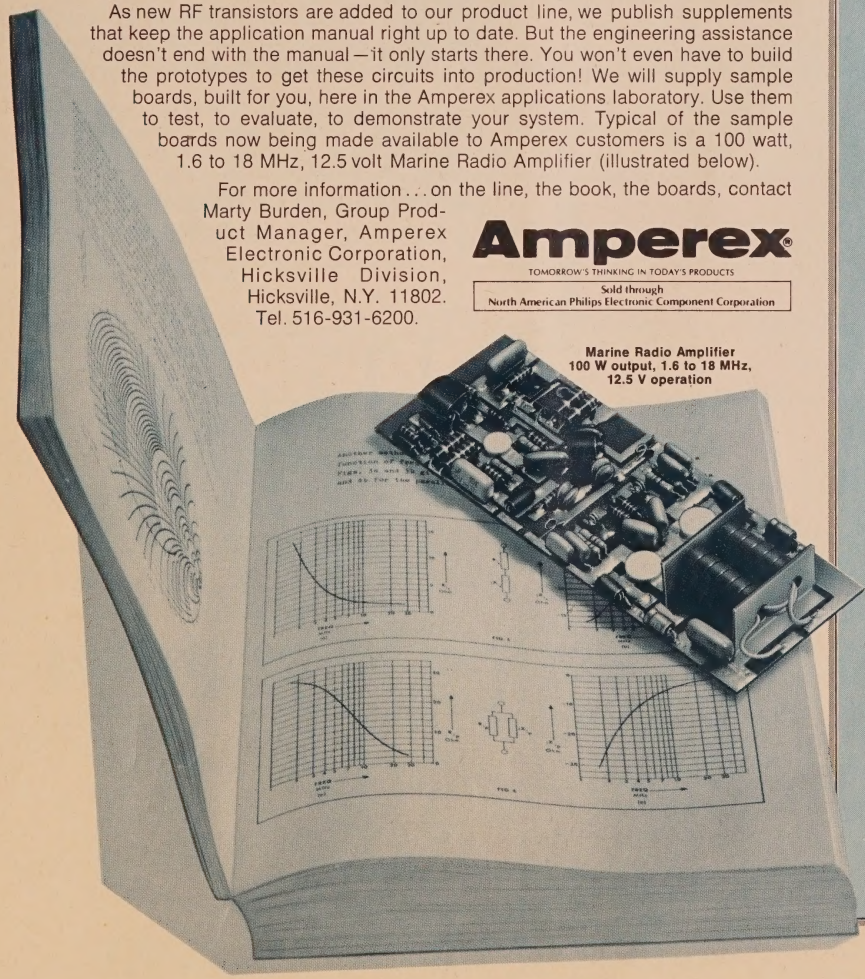

Marine Radio Amplifier
100 W output, 1.6 to 18 MHz, 12.5 V operation

... now— all these popular 2N types as well as our standard in-house types:

2N4040	2N5862
2N4041	2N5913
2N4127	2N5914
2N4128	2N5915
2N4428	2N5916
2N4429	2N5917
2N4430	2N5918
2N4431	2N5919
2N4933	2N5922
2N5016	2N5923
2N5070	2N5924
2N5071	2N5925
2N5090	2N5941
2N5102	2N5942
2N5108	2N5992
2N5177	2N5993
2N5178	2N5994
2N5589	2N5995
2N5590	2N5996
2N5591	2N6080
2N5635	2N6081
2N5636	2N6082
2N5637	2N6083
2N5641	2N6084
2N5642	2N6094
2N5643	2N6095
2N5644	2N6096
2N5645	2N6097
2N5646	2N6104
2N5687	2N6105
2N5688	2N6136
2N5689	2N6166
2N5690	2N6197
2N5691	2N6198
2N5697	2N6199
2N5698	2N6200
2N5699	2N6201
2N5700	2N6202
2N5701	2N6203
2N5702	2N6204
2N5703	2N6205
2N5704	2N6206
2N5705	2N6207
2N5706	2N6208
2N5707	2N6255
2N5708	2N6256
2N5709	2N6265
2N5711	2N6266
2N5712	2N6267
2N5713	2N6268
2N5714	2N6269
2N5773	2N6361
2N5774	2N6362
2N5775	2N6363
2N5776	2N6364
2N5846	2N6369
2N5847	2N6368
2N5848	2N6366
2N5849	

... our standard in-house types:

BFS22A	BLX95
BFS23A	BLY87A
BGY22	BLY88A
BGY23	BLY89A
BGY24	BLY90
BLX13	BLY91A
BLX14	BLY92A
BLX15	BLY93A
BLX65	BLY94
BLX66	2N3375
BLX67	2N3553
BLX68	2N3632
BLX69	2N3924
BLX92	2N3926
BLX93	2N3927
BLX94	

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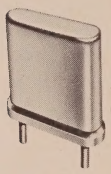

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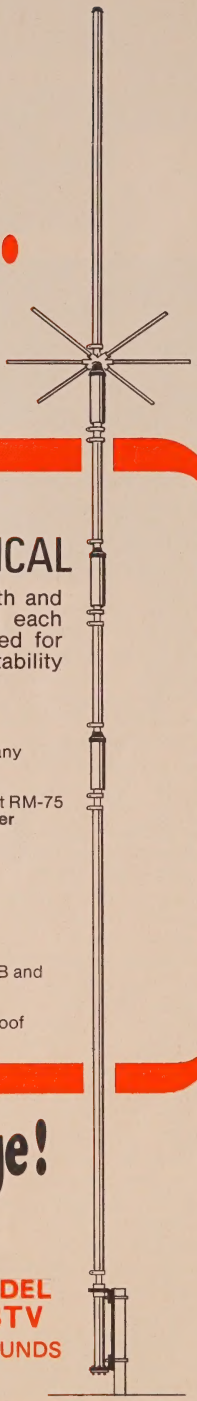

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- All sections **1¼" heavy wall,** high strength aluminum. Length 21'5".
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one setting for total band coverage!
40 THROUGH 10 METERS

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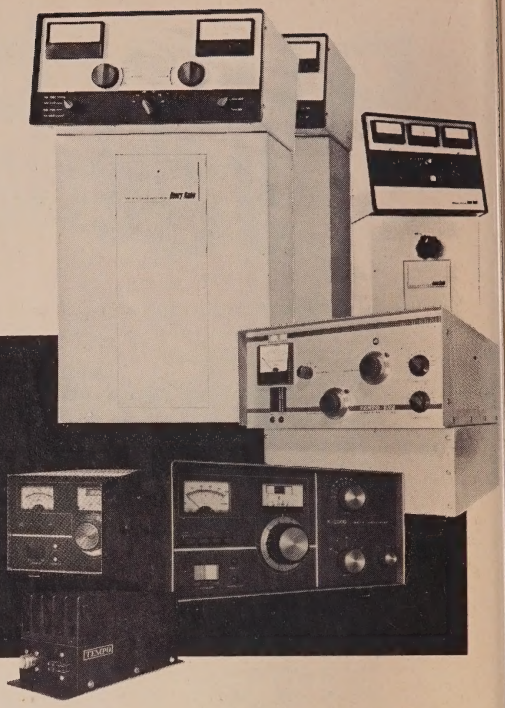

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The Tempo 6N2 brings the same high standards of performance and reliability to the 6 meter and 2 meter bands. Using a pair of advanced design Eimac 8874 tubes, it provides 2,000 watts PEP input on SSB or 1,000 watts input on FM or CW. The 6N2 is complete in one compact cabinet with a self-contained solid state power supply, built-in blower and RF relative power indicator. Price...$795

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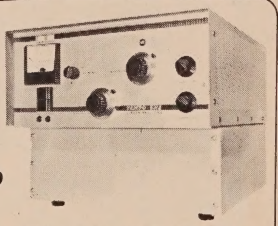

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The Tempo 6N2 meets the demand for a high power six meter and two meter power amplifier. Using a pair of Eimac 8874 tubes it provides 2000 watts PEP input on SSB and 1000 watts input on CW and FM. Completely self-contained in one small desk mount cabinet with internal solid state power supply, built-in blower and RF relative power indicator. $795.00

The Tempo 2002.. 2 meters only $695.00

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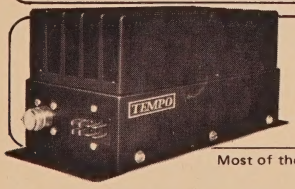

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VHF/UHF AMPLIFIERS

Solid state power amplifiers for use in most land mobile applications. Increase the range, clarity, reliability and speed of two- way communications.

VHF (135 to 175 MHz)			
Drive Power	Output	Model No.	Price
2W	130W	130A02	$199
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30W	130W	130A30	$189
2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159

UHF (400 to 512 MHz)			
Drive Power	Output	Model No.	Price
2W	70W	70D02	$270
10W	70W	70D10	$250
30W	70W	70D30	$210
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Butler, Missouri 64730 816/679-3127

Prices subject to change without notice.

Announcing

• **Charlotte, N.C.** — The Metro-Liner Hamfest, sponsered by the Mecklenberg Amateur Radio Society will be held on March 13, 12 to 6 pm and on March 14, 8 am to 4 pm at 531 S. College St. 3rd fl. Charlotte N.C. Flea market, door prizes, food available. For more information write: Metro-Liner Hamfest, 2425 Park Rd. Rm. 023, Charlotte, N.C. 28203.

• **Beltsville, MD** — The annual Maryland FM Association's Electronic Swapfest will be held on March 14, from 0830 to 1530 hours at High Point High School, 3600 Powder Mill Rd., Beltsville, MD. Donations are $2.00 per person, tables $3.00. Prize drawings at 1500 hours. Talk-in will be on 146.16/146.76 MHZ. For tickets and information write to: David McCrory, WA3TKW/KQI2199, P.O. Box 111, College Park, Md. 20740.

• **Southfield, Michigan** — The Southfield Highs Radio Station, WSHJ is having its annual Swap & Shop on March 14. For more information write to: Steven Shapiro, WSHJ, 24675 Lahser Rd. Southfield, Mi. 48075.

• **East Rutherford, N.J.** — The Knight Raiders VHF Club's auction and flea market will be held on Saturday, March 20th, at St. Joseph's Church of East Rutherford, Hoboken St., East Rutherford. Free admission, free parking, refreshments available. Talk-in will be on 146.52 and 146.94. Starts 11 am, tables: $5.00 full table, $3.00 half table. For reservations and information write to: The Knight Raiders VHF Club, K2DEL, P.O. Box 1054, Passaic, N.J. 07055.

• **Vero Beach, FL** — The Treasure Coast Bi-centennial Hamfest will be held at the Vero Beach Community Center Saturday & Sunday March 20, and 21.

• **Southeastern MI** — The Semara Club will hold its Eighteenth Annual Semara Swap "N" Shop on April 4, from 8 am EST to 3 pm EST, at the South Lake High School in St. Clair Shores, Mi., on the Southwest corner of Nine Mile Rd. and Mack Ave.

• **Muskegon MI** — The Muskegon area amateur radio council is sponsoring its seventh annual hamfest on Saturday March 20, at the Muskegon Community College. Tickets are $2.25 at the door — No advance mail sales. Dining facilities, open all day, free parking. For more information write to: Hank Riekels WA8GVK, Muskegon Area Amateur Radio Council, Box 691, Muskegon Mi. 49443. (616) 722-1378.

• **Kennesaw, GA** — The Kennehoochee Mini Hamfest will be held on Sunday, February 22, 9 am to 5 pm at the Dynamic Industries Warehouse. Indoor flea market, plenty of parking, refreshments served. For more information contact: WB4VXP or write to Ack Radio, 554 Deering Rd., Atlanta Ga. 30309.

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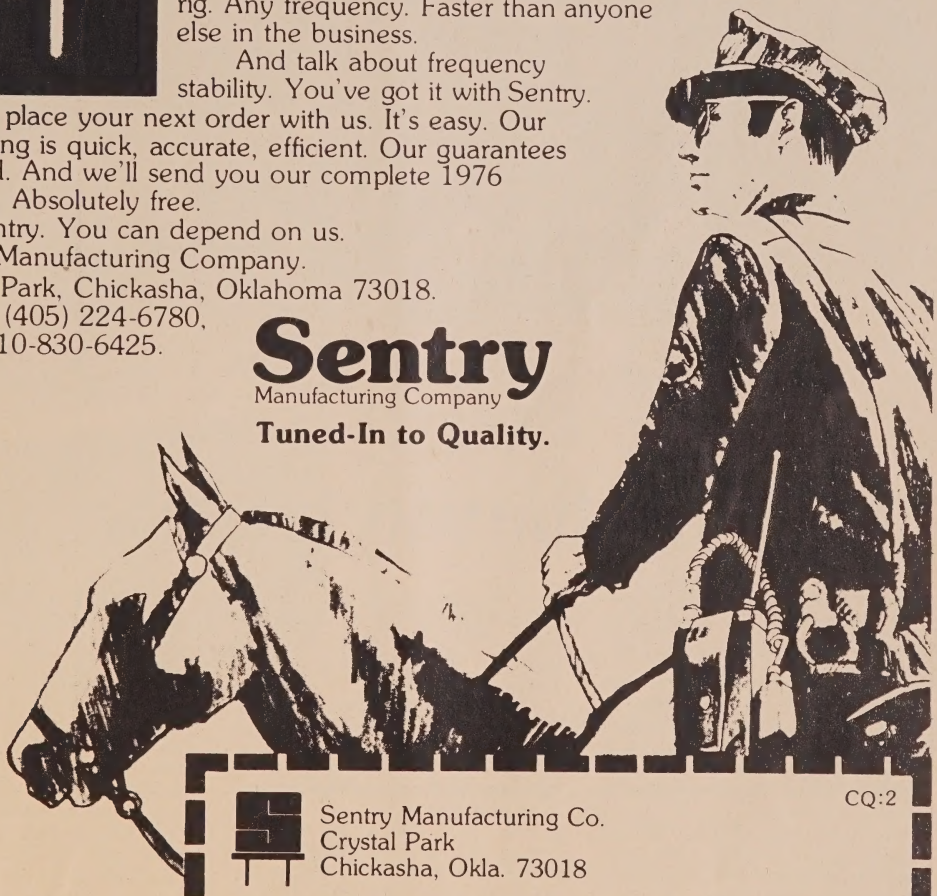

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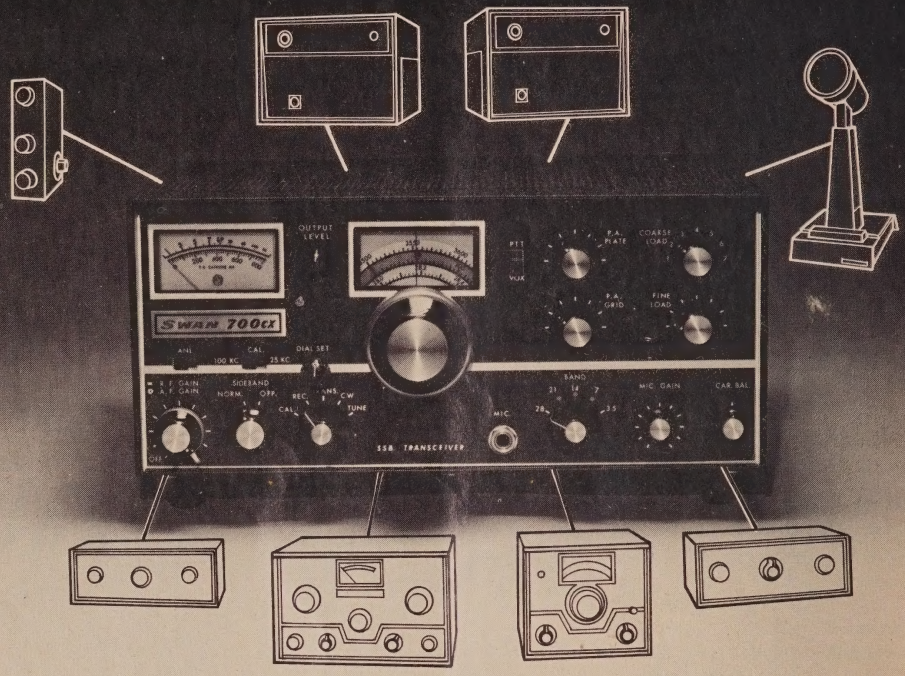

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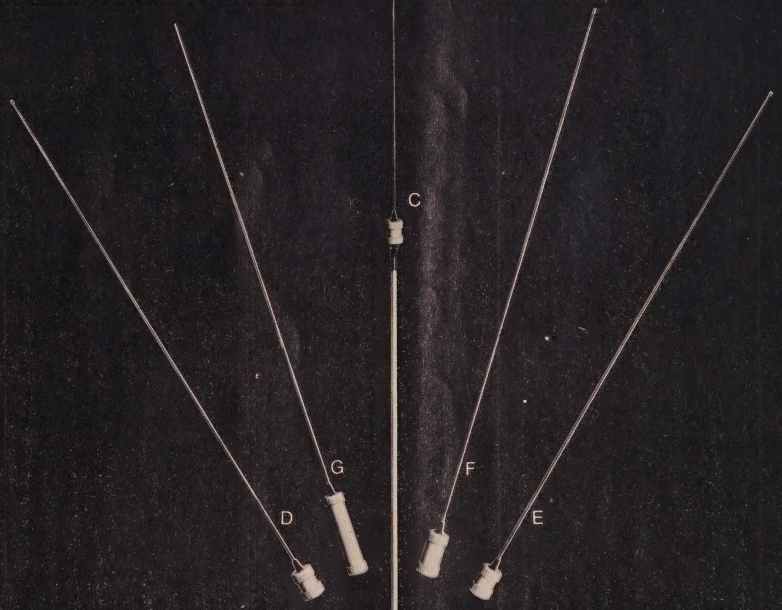

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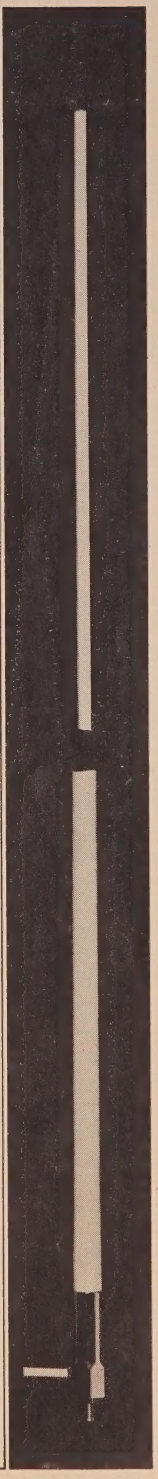

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Making A Good Transceiver Even Better

A few simple mods make the Atlas 180/210/215 series transceivers more flexible and convenient for both s.s.b. and c.w. work.

BY JOHN SCHULTZ, K3EZ

THE Atlas series of transceivers has certainly opened up many new operating possibilities for both mobile and portable operation. The transceivers have all the basic features one could need, especially for s.s.b. operation, but like any good thing, further improvement is still possible. This article summarizes first of all, the factory service bulletins which have come out on the 180 family. These are not described in any detail since they are available from Atlas, but many Amateurs might not be aware of their availability. Then, various ideas and modifications are described in detail which can improve the versatility of the transceivers. Some are no-hole modifications while others require the mounting of new controls or switches on the front panel.

One shouldn't be afraid of "operating" on the front panel if it is done with care. Fortunately, all the front panel controls and switches are screw-fastened or shaft-nut-fastened so one can remove the whole front panel rather easily. A new front panel can be purchased and installed later whenever one might want to remove some modification and restore the unit to its original condition. All of the modifications described are applicable to the entire 180/210/215 series unless otherwise mentioned.

Service Bulletins

Bulletin 1: Discusses power output variations between units and reasons why they exist. Procedure to adjust power output level if below specs in c.w. mode.

Bulletin 2: Self oscillation in transmit mode, especially when working into reactive loads. Describes re-routing of coax to PA enclosure. Applicable to units below serial 2300.

Bulletin 3: Reduced sensitivity on 10 and possibly 15 meters. Describes changing of v.f.o. transistors and retuning of 10/15 input circuits. 210 units only.

Bulletin 4: Describes installation of i.f. and image suppression traps. Not usually needed but if one is going into an unusually strong signal density area, such as portable in Europe, the traps might be worthwhile.

Bulletin 5: Various small modifications to improve a.g.c. action and c.w. keying waveshape.

None of the above Service Bulletins presents any major modifications to the 180 family. Unless one has experienced difficulty with a 180/210/215 series transceiver in any of the specific areas mentioned, it generally is not necessary to pursue the matter further. The Atlas Co. seems, however, most willing and cooperative to be of help when needed. Requests for Service Bulletins should be addressed to: Atlas Radio, Mr. Clint Call, W6OFT, Customer Service Manager, 417 Via del Monte, Oceanside, Calif. 92054.

Parts for the modifications involved are available on a very nominal or no-cost basis. The best thing to do when contacting Atlas is to mention which Service Bulletins seem to be applicable and to give the *model* and *serial* number of the transceiver involved.

Portable Power

Any source of 12 volts that can supply about 8 amps. continuous and 16-18 amps. peak can be used as a portable power source. Obviously many different sorts of batteries can be used and one can sometimes find good buys in nic-cad batteries from surplus houses. The use of nic-cad's with a 7.5 amp./hr. rating will allow full power operation. An available battery pack which has been tested with

many 180 family units is the Globe-Union GC-1200 rechargeable power pack. It is not a nic-cad unit but a completely sealed gelled electrolyte type of battery supplying 12 volts at 7.5 amp./hr. It comes complete with a case (6½" × 6½" × 4") and a.c. charger and makes for a really compact power source. It is available for about $60 from many supply houses (Burstein-Applebee, for instance) and will work for several hundred charge/discharge cycles. Its one big disadvantage is that the charger will burn up on 50 Hz so don't take it overseas! The author learned this the hard way and inquired of the company if a few more cents couldn't be spent on transformer iron in the charger to make it truly portable for 50/60 Hz operation. No reply.

How long you can operate with the pack depends on the transmit/receive time ratio. Under normal s.s.b. usage it will last about 2 hours per charge at full power. This time can be considerably extended by turning down the mic. gain in s.s.b. or in c.w. (for latter mode mic. gain becomes carrier insertion

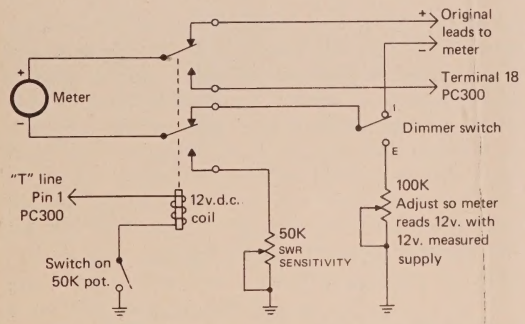


Fig. 1—Circuit to allow front panel meter to function additionally as a voltmeter to read supply voltage and as a meter to read the reflected power output indication of the built-in s.w.r. bridge.

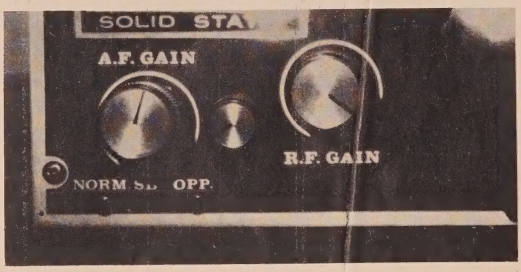
control) once initial contact has been established.

Whatever portable power source is used, note that the 180 family power output varies quite a bit with the supply voltage. At 13.6 volts (the spec. voltage) output is 80-100 watts. At 11.5 volts it drops to 55-70 watts. At exactly 12 volts it is 62-77 watts.

Dimmer Switch Modification

One of the simplest but very useful modifications is to get a little more use out of the dimmer switch. In most installations, it isn't necessary to have two levels of dial illumination available. So wire in the desired level and this will free the dimmer switch. Figure 1 shows an arrangement where the panel meter is used in a switching arrangement so it functions, as normal, as an S meter in receive but in transmit can be used to measure supply current, voltage or reflected power from the built-in s.w.r. bridge. This supplies a lot of useful information since the output power is very dependent on the supply voltage and s.w.r. It also eliminates the need for an external s.w.r. bridge if a matching network is used since one can tune it simply for minimum reflected power. The scale on the panel meter is perfect for voltage measurement since it is already calibrated for a 0-16 range.

A relay is used to switch the meter for the s.w.r. function. A surplus crystal-can relay is ideal for this purpose and draws very little current (10-30 ma). The relay can be mounted in any location, one convenient spot being on the bracket behind the meter. A switch on the sensitivity pot for the s.w.r. function is used to activate the relay. The former dimmer switch is used to switch between voltage or current measurement. The 100 K series multiplier pot can be a PC type mounted by the switch. The sensitivity pot (a miniature ⅝" dia. transistor



The s.w.r. Sensitivity control knob is located between the a.f. and r.f. gain controls at the lower left side of the Atlas front panel. The panel light dimmer switch is used for meter switching, while the panel lights are permanently wired for the desired brilliance.

radio replacement type available in most radio supply houses) is mounted in a hole drilled between the a.f. and r.f. gain controls. Used with a small knob, it will not interfere with use of the controls. One can, of course, wire the dimmer switch alone for voltage/current measurement and forget the s.w.r. function if desired.

CW Monitor

Figure 2 shows a simple but effective c.w. sidetone oscillator. It can be mounted on a small PC board behind the a.f. output jack on the rear panel of the transceiver. Because it takes its power from the +c.w. line, it is only activated in the c.w. mode. The output level is sufficient for loudspeaker or headphone operation. An adjustable output level is often convenient to have and a 1K miniature pot for

this purpose can be mounted on the rear panel just above the "neg.gnd" socket.

Receiver Incremental Tuning

This is probably the single most desirable feature that the 180 family lacks. Many schemes were tried to install RIT that would be effective and yet not upset the good frequency stability of the v.f.o. One problem is that different oscillator ranges are used on different bands and so it is almost impossible to derive a simple RIT scheme that would have exactly the same frequency range on all bands. A compromise arrangement was finally made which is relatively simple and which provides a tuning range of about ± 1.5 kHz on 80 meters to ± 5 kHz on 10 meters. This range is still more than enough to prevent leap-frogging.

Figure 3(A) shows the RIT circuit. A relay was used, although a more complicated electronic switching scheme is possible, because small crystal-can relays are very compact, reliable and inexpensive through surplus outlets. A Varactor diode and series fixed 24 pf capacitor are connected from the collector to ground of Q_{401}, the v.f.o. oscillator stage. The fixed capacitor must be either a silver mica or NPO type. If one carefully examines the v.f.o. PC board in the area of Q_{401} there will be found some unused connection points. These can be utilized to mount the added components on the PC board. The manner of mounting is not critical except that all components should be rigidly soldered in place and the 1 meg resistor should be as close as possible to the junction of the Varactor and the 24 pf capacitor.

Tuning is accomplished by a miniature 100 K pot (with switch) mounted on the front panel to the right of and below the mic. gain control. It is the only room left on the right side of the panel to mount a pot but the location is a convenient one for operating purposes. A small lamp can be mounted above the tuning pot to indicate when the RIT function is active. The connection points for the coil of the relay were chosen so that during transmit the relay will always de-energize even if the RIT switch is on to ensure the transmitted frequency remains constant.

The Varactor does not have a linear voltage/capacitance characteristic. The 50 K pot going from the slider arm of the 100 K "tuning" pot is adjusted so that 2.5 volts is present on the slider arm with the 100 K tuning pot set in its center position. The slider arm on the 100 K "set" pot is set also to 2.5

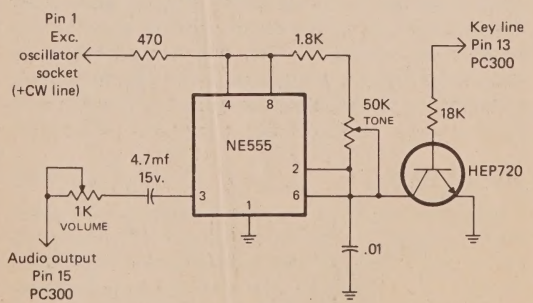
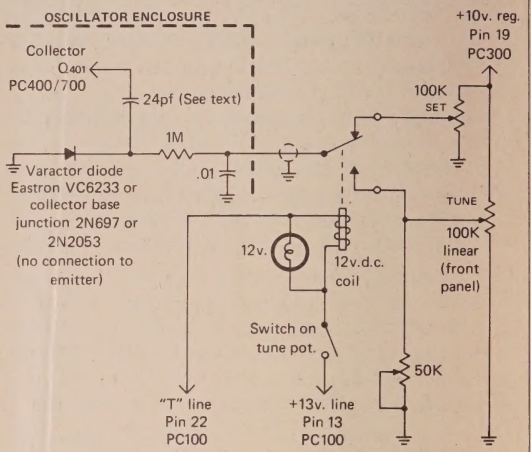
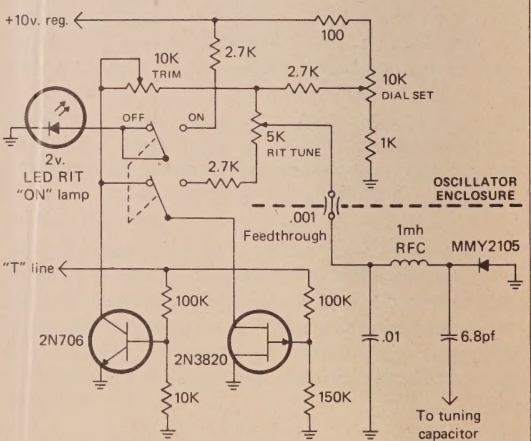


Fig. 2—C.w. sidetone oscillator. Circuit is active only in the c.w. mode and output is sufficient for both headphone and loudspeaker use.

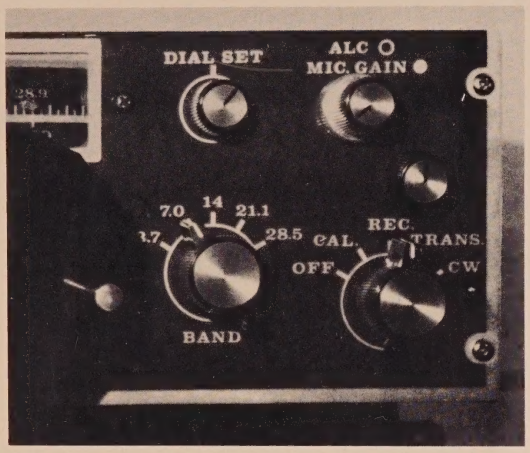


(A)



(B)

Fig. 3—(A) RIT (receiver incremental tuning) circuit. This is one of the most useful circuits that can be added to the 180/210 family transceivers. (B) This more elaborate all-electronic RIT circuit was developed for Atlas. Notice that the Dial Set capacitor is replaced by a pot. The Trim pot is adjusted so no frequency shift occurs when going from RIT "on" to "off" with the RIT tune pot centered.



Receiver Incremental Tuning control knob fits nicely into the front panel layout of this Atlas 210, just above the Mode switch.

volts. Measure both voltages with a high input resistance v.t.v.m. The adjustment centers the frequency control range of the RIT tuning pot fairly well although one can do it much more exactly with a counter on the v.f.o. The 50 K pot and the 100 K "set" pot can both be PC types and mounted directly on the terminals of the tuning pot. The relay can be mounted anywhere on the chassis next to the PC 100 module. "Mounting" of the relay need not be with screws. Epoxy or other cement will keep the light-weight crystal can relays in place under the roughest mobile use.

Figure 3(B) shows a completely all-electronic RIT circuit although it is a bit more complicated. As shown, it would require a front panel mounted d.p.d.t. switch plus the RIT tuning pot. The LED "on" lamp for the RIT function could be eliminated. But a s.p.d.t. switch on the RIT tuning pot would still be required to implement the circuit with only one front panel hole.

25 kHz Calibration Markers

The 100 kHz crystal calibrator of the 180 family does not allow easy determination of sub-band edges. Atlas probably did not install a 25 kHz calibrator because of the nature of the v.f.o. design they choose. The dial set capacitor covers such a wide range on some bands (well over 25 kHz) that confusion would result with 25 kHz markers. A 25 kHz marker can still be installed, however, but it would either have to be switchable in and out or the dial calibration tightened up so the dial set capacitor need hardly be changed from its 12 o'clock position. The latter can be done with a counter and patience, working with the v.f.o. notes

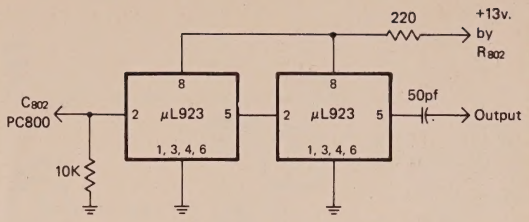


Fig. 4—This circuit will provide 25 kHz markers from the 100 kHz calibrator. Lift the shielded wire going to C_{802} and insert in series. Note precautions in text on use of such a circuit.

found in the Atlas manual. The circuit of a simple divider circuit that will produce 25 kHz markers from the 100 kHz internal calibrator is shown in fig. A.

Simplified CW Switching

Usage of the 180 family on c.w. is awkward because to go from receive to c.w. send one has to rotate the function switch from "rec." through "trans" to "CW". There are several ways to improve this situation. One can mount a miniature toggle switch directly below the r.f. gain on the front panel, wired as shown in fig. 5. This serves as the c.w. send/receive switch and the function switch is left in the "rec" position. Another approach is electronic switching, activated each time the key is depressed. A good circuit for this purpose developed by some German amateurs is shown in fig. 6. The d.p.d.t. relay is wired the same as the d.p.d.t. switch of fig. 5. The pull-in time of the relay will not be noticed at normal keying speeds and the fall-out time after keying stops is adjustable by the 5 K pot. If a crystal-can relay is used, there is enough room along the outside side of the PC 100 board to install the circuit internally.

CW Selectivity

Although the 180 family has an excellent s.s.b. filter, more selectivity will be quickly desired by

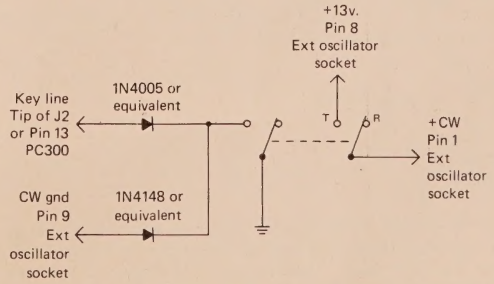


Fig. 5—Simplified send/receive switch for c.w. It may be installed either internally or externally.

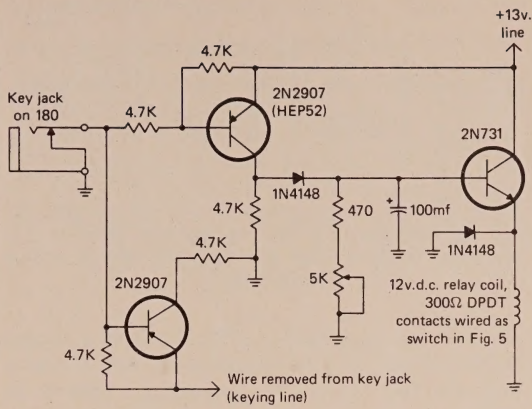


Fig. 6—Neat little semi-break-in keying circuit. 5 K pot regulates hold-in time of relay.

anyone working much c.w. As usual, the a.f. filter approach or the i.f. filter approach is possible. It is probably possible to somehow add still more controls and switches to the front panel of the transceiver but it was decided to use an external enclosure for the c.w. filters tried. There are many designs available for active a.f. filters which can be made to work with the 180. One good peaking filter is shown in fig. 7 which is intended for headphone operation only. It can be mounted in a separate enclosure and the power and audio output lines to it taken over the "ext spkr" and "ext osc"

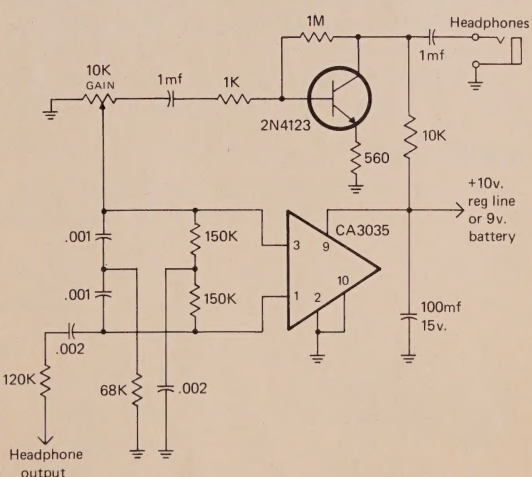


Fig. 7—Active a.f. c.w. filter peaking at 1000 Hz. It can be mounted in an external enclosure or internally. Note that the "Ext Spkr" jack on the 180/210/215 is a two-circuit type. Regular audio can be fed out on one circuit and peaked audio fed out on the other with a selector switch at the headphones.

plugs on the 180. An alternative is to mount it internally near the loudspeaker where there is sufficient space.

Fortunately, Atlas did bring the line to the 5520 kHz i.f. filter to the "aux" socket on the rear panel. One has to remove the internal short between pins 6 and 9 on this socket but then one has available a circuit in series with the s.s.b. filter and also a +12 volt line.

A simple external two pole crystal filter used in series with the s.s.b. filter will provide very good c.w. selectivity at low cost. A suitable circuit is shown in fig. 8. The crystals themselves can be ordered from a source such as JAN crystals. The trimmers are used to make the response symmetrical about the center frequency. The best way to adjust them is with a scope but fair/good results can be achieved even without test instruments by using the 100 kHz calibration oscillator as a test signal and watching the S meter as the signal is tuned through. Since the filter will be in the i.f. chain in the transmit mode also it must pass the carrier frequency. First be sure the filter works fine in the receive mode. If then a power output drop occurs on transmit as compared to without the filter, the carrier frequency offset trimmer C_{608} on PC600 needs to be readjusted. Put the sideband selector switch in "norm" position and adjust C_{608} so the former power level is restored.

For those who really insist on keeping all modifications within the transceiver, the c.w. i.f. filter could be placed inside the transceiver and switched

(continued on page 70)

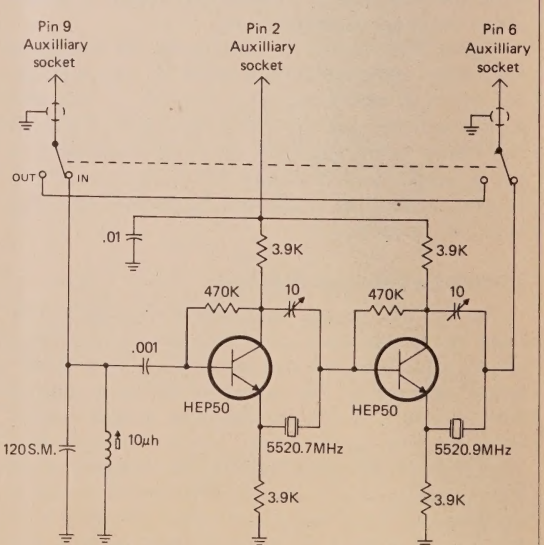


Fig. 8—200 Hz c.w. i.f. filter. The slug tuned coil is peaked to equalize gain with c.w. filter switched into i.f. signal path.

Battery chargers. You can buy one or build one, but sooner or later you'll need one. W6GXN explains their operation and design.

We Don't Charge Nothin' but Batteries!

BY HANK OLSON, W6GXN

The title, once seen by the author in a small service station, certainly reminds us of the relation between finances and battery care. Even though the cost of storage batteries is high, most of us are content to accept the fact that some part of our car's electrical system keeps them full of ampere hours. However, when you've left your lights on for hours (it was foggy when you drove home) and the starter won't turn the motor over, how does one avoid calling road service?

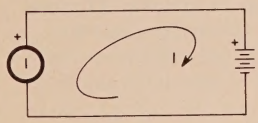


Fig 1—Basic charger using constant-current generator.

Battery chargers are available from Sears or Wards catalogs at prices that vary from under $10 to over $100. The great range in price of chargers is mostly because of charge rate capability; the cheapest units will only charge at a few ampere rate. Metering and control systems also add to the cost of the more expensive chargers. Having one of these chargers around one's garage can prove to be handy on occasion, especially if your vehicle is one that sees only occasional use.

But what *is* a battery charger? Can one build his own, and if so; are there any advantages in doing so?

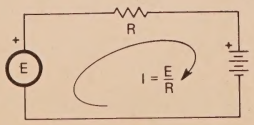


Fig. 2 — Approximation of constant-current charging using constant-voltage generator and series resistor, R.

A battery charger is basically a current source which causes current to flow *back* into the (discharged or partially discharged) battery, in the opposite direction from the way it flowed when the battery was in use. This is shown in fig. 1. Since current sources are not as common as voltage sources, a voltage source and series resistor are used to approximate a current source, as in fig. 2. Unless *E* in fig. 2 is very large compared to the battery voltage, the approximation to a current, source is rather poor. This results in a decrease in charge current as the battery charges, as its terminal voltage increases (which may be a beneficial effect). Let us see, by an example, what happens to current as battery voltage changes. In fig. 3 (A), a constant voltage of 111 volts, in series with 20Ω is used to charge a battery whose terminal voltage in the discharged state is at 11 volts. The charging current to begin with is (111−11) v./20Ω = 5 amps. At a later time, the nearly-charged battery voltage

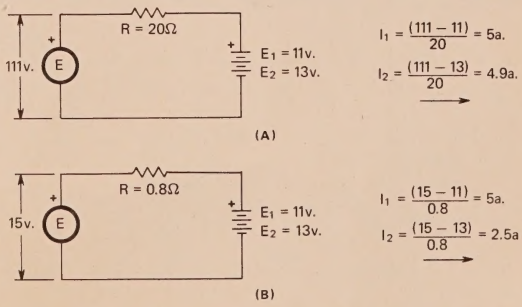


Fig. 3—(A) Charging battery from 111 v. constant-voltage source. (B) Battery charging from 15 volt constant-voltage source.

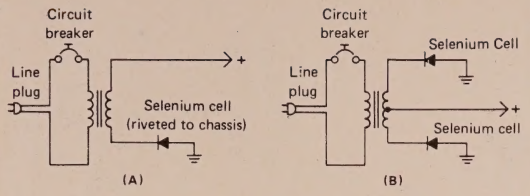


Fig. 4—Typical commercial battery chargers. (A) Half-wave. (B) Full-wave.

rises to 13 volts, and the charging current becomes (111−13) v./20Ω = 4.9 amps. That is, the charge rate has only varied 2% over the charge period. In fig. 3(B) is a more typical charger with a 15 volt constant d.c. source and 0.8Ω of series resistance. At the start of charging our *same* discharged battery the charging current will be (15−11) v./0.8Ω = 5 amps, but near the end of charge will be only (15−13) v./0.8Ω = 2.5 amps. This considerable change in charge rate over the period, makes it rather difficult to calculate how many ampere-hours of charge were put into the battery. This "tapered charge" sort of battery charger is quite typical and is inexpensive to construct. For instance, an inexpensive (less than $15) charger in one of the mail order catalogs is advertised: "Initial surge of 5 amperes tapers to 2 amperes as charge builds up."

What does the actual circuit of a battery charger look like? Most simple ones today consists of a transformer and selenium rectifier, as shown in fig. 4. The least expensive are half-wave rectified, and more expensive units use full-wave rectifiers (two selenium rectifiers, with a center-tapped transformer). It may seem surprising to find relatively old rectifiers, like selenium disc types, used in modern chargers, but they are still inexpensive and

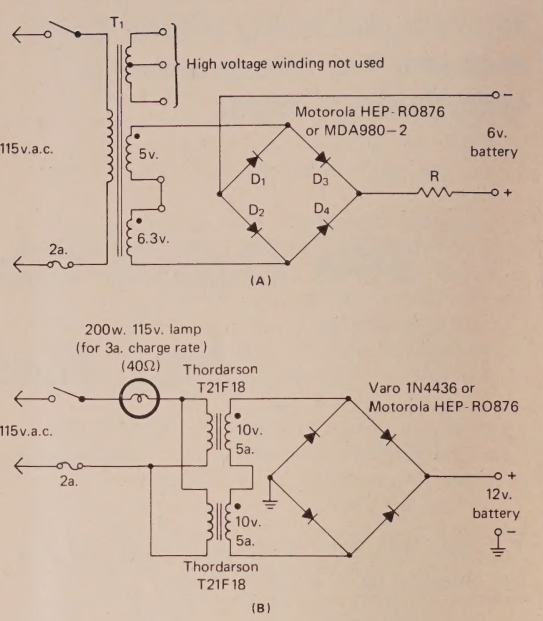


Fig. 5—(A) Full-wave 6 volt battery charger built around discarded tube-type TV set power transformer. (B) Simple 12 volt battery charger with current-limiting resistor in transformer primary.

their high forward resistance provides the series resistance needed. If more efficient silicon or germanium rectifiers were used, additional expense would be incurred in having to supply a resistor.

In years past, other types of rectifiers were used: wet cell rectifiers consisting of aluminum plates in jars (or crocks) of boric acid solution, copper oxide disc rectifiers (similar in construction to selenium),

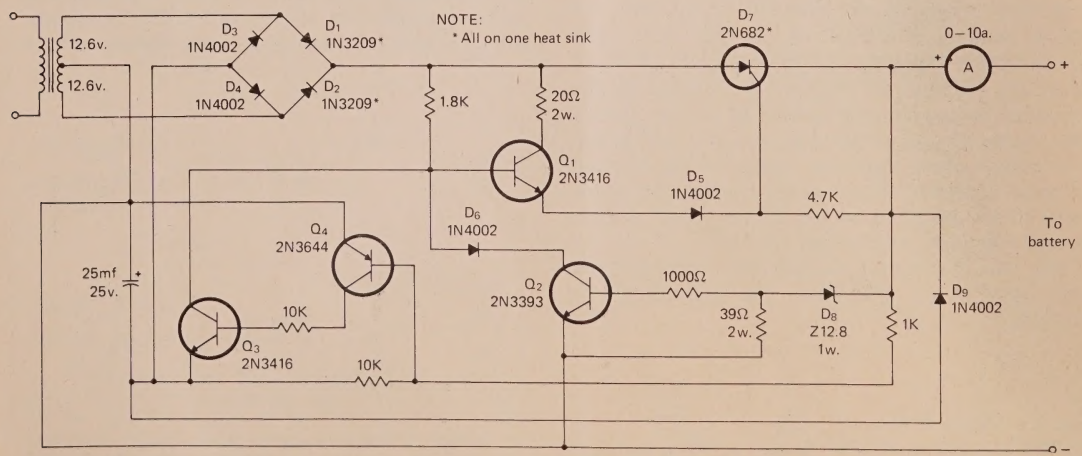


Fig. 6—Schematic of Heath GP-21 battery charger (with added parts identification by author).

and vacuum tube type (tungar-bulb*). These rectifiers are all obsolete now, but often one may find older chargers around that use them. These old chargers can usually be brought back to life by replacing the obsolete rectifiers with newer silicon units and adding a new suitable series resistance.

One can also build his own battery charger from components commonly available around electronics shops. Older TV sets, of the tube variety, often will yield a power transformer with multiple heater windings, which can be series-connected to give enough voltage and current for battery charging. The charger in fig. 5 is an example of such use of an old TV set power transformer. Since most of the older TV sets used 5U4G rectifier tubes, one can usually count on a 5 volt secondary rated at 3 amps. The main 6.3 volt winding is usually good for several times that, so an adequate 3 amp charger for 6 volt batteries is obtained. Be sure *not* to use the smaller 6.3 volt secondary sometimes included to operate the heater of the TV set damper tube, as it will only be good for about 1.2 amps. The charger of fig. 5(A) shows the use of one of the integrated bridge rectifiers of Motorola, but many other quads of separate rectifier diodes could be used instead. For instance, the Silicon diodes from an old automobile alternator are more than adequate. An ammeter is another item that can be often salvaged from an old auto. The series resistor

*Tungar is a trademark of General Electric.

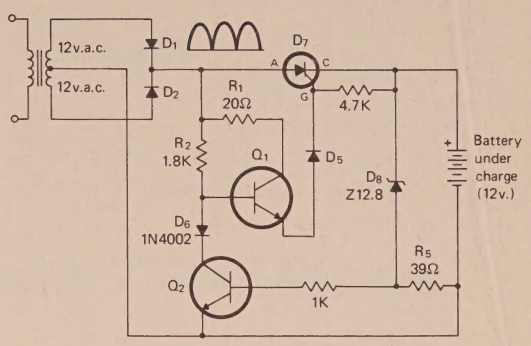


Fig. 7—Simplified circuit of Heath GP-21 charger.

can be home-made too, even a piece of old barbed-wire fencing or baling wire can be pressed into service. Note that a variation of the circuit of fig. 5(A) puts the series resistance in the *primary* instead of in the secondary circuit. The wattage of such a primary resistor will remain the same, but it can be a larger resistance value—which is probably easier to obtain from an electronic experimenter's junk box. This variation is shown in fig. 5(B). Note that it is a simple matter to provide two values of resistance in either fig. 5(A) or 5(B), so that charging may be done at the full 3 amp rate or at a "trickle" rate of, say, 0.3 amps. The "trickle" resistor is, of course, a much larger resistance. The

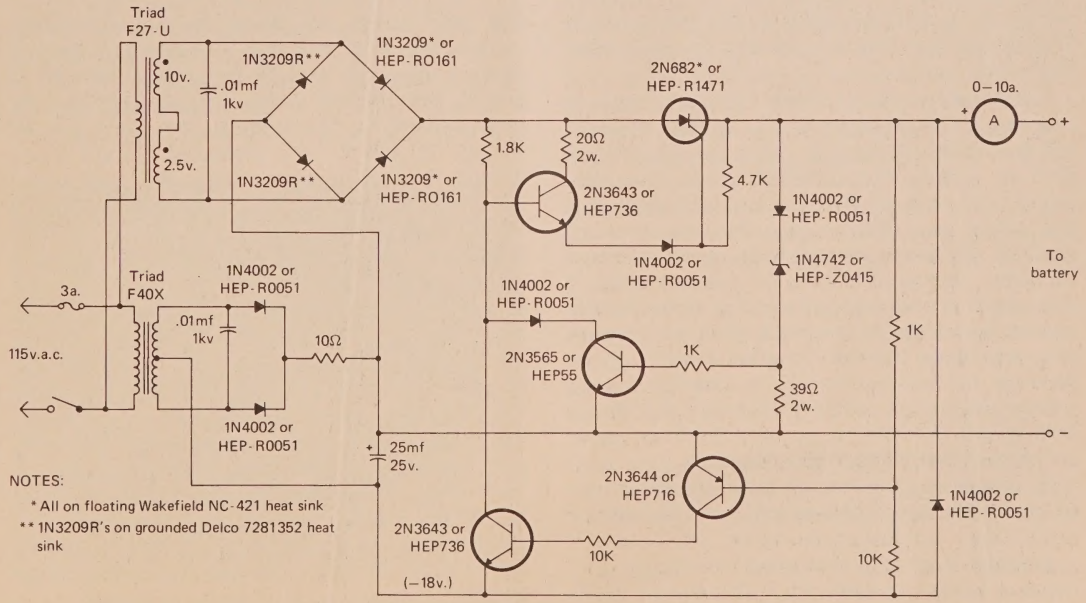


Fig. 8—Modification of GP-21 circuit to use commonly available components. This circuit was constructed by the author (at greater cost than the GP-21!).

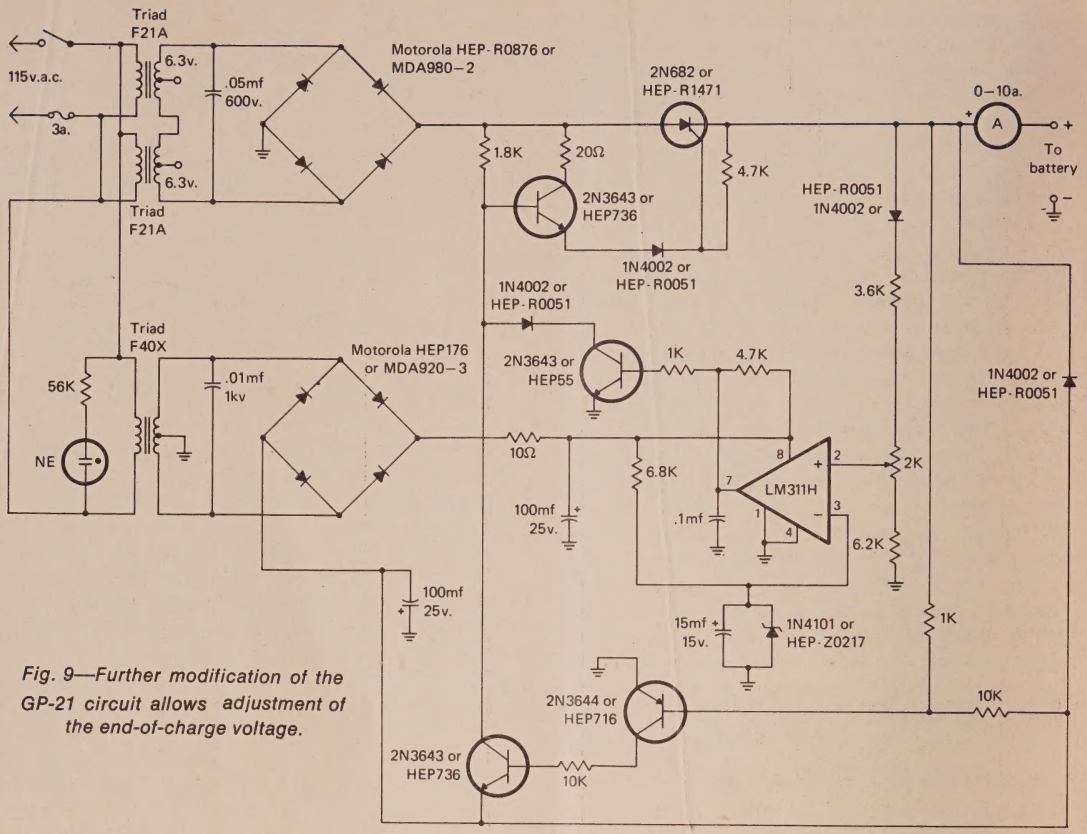


Fig. 9—Further modification of the GP-21 circuit allows adjustment of the end-of-charge voltage.

resistor in fig. 5(B) is actually a common light bulb. The charge rate may be changed by using other size lamps.

In the last few years, several really new types of chargers have appeared on the market. Heathkit has now a pair of chargers that are *much* different from the simple ones described above. They both use an SCR as a switch to connect and disconnect the battery at a 120 Hz rate. The circuit of the Heathkit GP-21 charger is shown in fig. 6, and a simplified version of it in fig. 7. Looking at fig. 7, it is seen that each half cycle of the 60 Hz line frequency the voltage at the anode of D_7 will go positive causing the base of Q_1, to be forward biased (through R_2) and causing Q_1 to conduct current through R_1, and D_5 to the gate (G) of D_7. This in turn, causes D_7 to turn on for part of the half cycle, and charge the battery. Note that once D_7 is gated "on" it stays on until the net voltage across it drops to zero. Note that in this case D_6 and Q_2 are not conducting.

At a later time, after the battery has been charging, the battery terminal-voltage is higher. Under this condition (battery-terminal voltage higher than 12.8 volts) zener diode D_8 conducts, causing a voltage drop across R_5. When the battery-terminal voltage gets up to 13.4 volts (considered to be full-charge) there will be a 15 ma flowing through D_8 and R_5, and 0.6 volts drop across R_5. This 0.6 volts drop causes Q_2 to conduct and draw current through D_6 and R_2. The increased current drawn through R_2 drops the base voltage of Q_1 and current can then no longer be drawn through R_1, Q_2, and D_5 to turn on D_7.

Note that in the Heath GP-21 that the additional circuitry (D_3, D_4, D_9, Q_3, Q_4, C_1, R_6, R_7, and R_8) not shown in fig. 7, is for protective purposes. That is, the additional circuitry protects against battery polarity reversal and accidental shorting of the output leads.

In fig. 8 is shown a charger built by the author that is essentially similar to the GP-21, but using available parts. This charger is almost certainly more expensive to build than purchasing a GP-21 kit, but does show substitutes can be made—especially if one has an adequate junk-box. Note that the special 12.8 volt zener was replaced by a selected IN4742 and a forward-biased IN4002.

(Continued on page 69)

Take one slightly obsolete a.m. rig, and add a few hour's labor and a handful of junkbox parts. Result: A cheap 90 watt rig for Top Band.

Putting the Heath Cheyenne on 160 Meters

BY DAVID R. COAHRAN, WA7FNK

For the last twenty years, relatively few Amateurs have used the 160 meter band. For several years after WW2, the band was allocated for Loran navigation. Eventually, narrow segments were released for low power Amateur use. But the cut-up band, low power limits, Loran QRM, and easy DX on higher bands kept 160 from regaining its pre-war popularity. The '50s saw the rise of commercially-built rigs, many of which did not cover 160. The "top band" was almost forgotten by most Hams.

Time has a way of changing things, though. V.h.f. navigation systems are replacing Loran. This has allowed wider Amateur segments and higher power on 160. The pileups and almost too-easy DX on 20 can pale after a while. 160 is relatively free of QRM now, and is an ideal location for local nets and ragchewing. The coming sunspot minimum helps, too, and any DX worked has far greater personal value that it would have on the h.f. bands.

Overall view of the modified Cheyenne shows no changes except the addition of the Drive Level control to the right of the Spotting switch and below the word "Plate."

But very little commercial gear is available for 160. Homebrewing for this band is easy enough, but I chose to convert a Heath Cheyenne (MT-1) instead.

The Cheyenne was designed for 90 watt a.m. mobile use on 80-10 m., but provision for c.w. was included. A.m. mobile is long gone, but a rugged, compact c.w. rig with a good v.f.o. is always useful, so I bought a Cheyenne five years ago to use "'til I built a better rig." Since then, it has made WAS, put a dozen rare countries on (with W4UWZ/7), and kept a weekly schedule for two years with no misses. Its design makes the addition of 160m. easy, and the current price is only in the $25-$40 range.

The conversion described here adds the 160 meter band without sacrificing existing coverage. Other changes decrease subharmonic output and reduce buffer and driver dissipation, and prolonging tube life.

The Cheyenne v.f.o. operates on 160 meters for the 80 meter band and on 40 meters for 40 through 10. To operate on 160, only the driver and final plate circuits need to be changed. The modified circuit is shown in fig. 1. Added components' labels are underlined.

To maintain reasonable final plate circuit *Q* and tuning range on 160, the tuning capacitance, loading capacitance, and tank inductance all must be increased. S_1a makes these changes.

C_1, paralleling the tuning capacitor, consists of 150 pf 5 kv and 33 pf 1 kv disk capacitors in parallel. Two 360 pf silver mica capacitors in series should do the job and would be much easier to

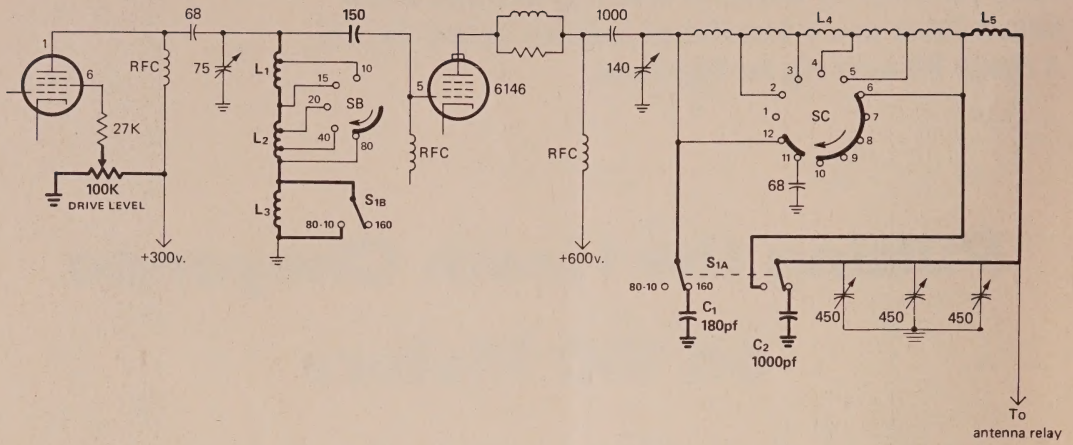


Fig. 1—Modifications to Cheyenne driver and final circuitry, to give 160 meter operation and reduced subharmonic output on 80-10 meters. Wiring and components shown in heavy lines are new or changed.

L_1—55 t. # 30 on Amidon T-50-2 core. Tap at 30 t. from hot end.
L_2—21 t. #24 on Amidon T-50-2 core. Tap at 9 and 14 t. from hot end.
L_3—100 t. #30 on Amidon T-50-2 core. See text for more winding information.
L_4—Original output tank coil.
L_5—28 t. #18 on Amidon T-106-2 core. See text for more winding information.
S_1—160 meter switch. Two Centralab PA-3 ceramic sections mounted 2½" apart on Centralab PA-301 indexing assembly.

obtain. C_2, across the loading capacitor, is a large 1000 pf mica. The 1000 pf disc capacitor first tried became too hot to touch in a few seconds—no surprise, since the r.f. current through it is about ¾ amp! A Centralab 858S-1000 transmitting capacitor should be an excellent, though rather expensive, substitute if your junk box can't supply a similar mica. A 1000 pf silver mica might do the job, too, at a lower price.

L_5, in series with the original output tank, consists of 28 turns to #18 enameled wire on an Amidon T-106-2 core. Wind a layer of Teflon pipe joint tape (available at many hardware stores) on the core before the wire to reduce the possibility of arcing.

Cheyennes apparently were built with two different driver plate circuits, shown in figs. 2(A) and 2(B). The one I converted used the circuit of fig. 2(B). I was unable to use the original coil without rewinding it, and chose to replace it with toroidal coils. L_1 and L_2 cover 80 through 10. For 160, S_{1B} switches L_3 in series with them. Wind L_3 in layers with Teflon pipe joint tape split to ¼" width wound between layers. This type of winding provides a large distributed capacitance, which helps increase the Q of the circuit. Mount L_1 and L_2 by their leads on the original bandswitch. To support L_3, loop one end of a piece of #18 wire around it, and solder the other end to an unused lug on S_{1B}. Make sure the loop is not quite closed to prevent its acting as a shorted turn on L_3. In Cheyennes using the circuit of fig. 2 (A) you can probably use the original driver coil instead of L_1 and L_2, though the number of turns on L_3 might have to be changed slightly.

The top view photo shows the arrangement of parts above the chassis. Mount S_1, the 160 meter

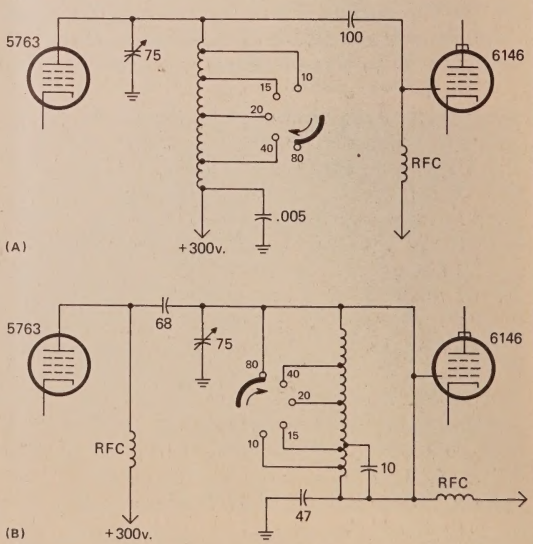


Fig. 2—The two alternate driver circuits used in different runs of Cheyennes.

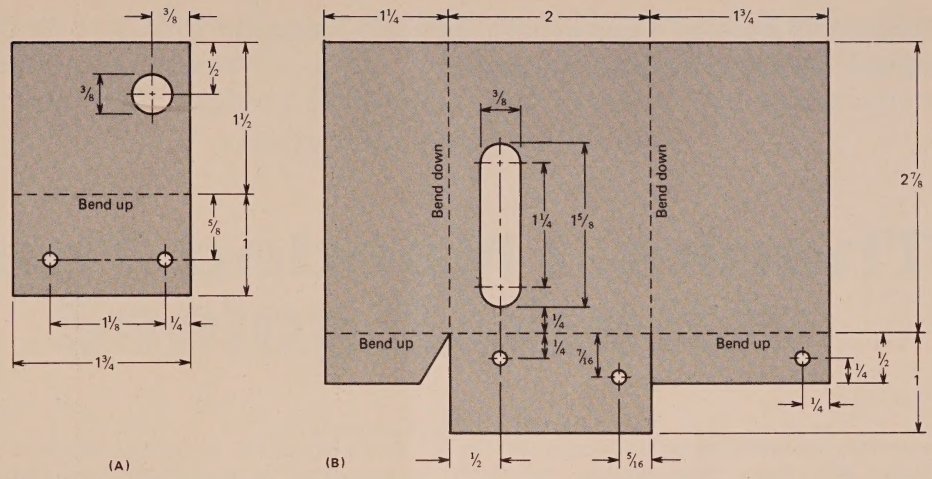


Fig. 3—(A) Mounting bracket for S_1. (B) Shield for S_1. Mounting bracket should be constructed of fairly heavy aluminum for strength, while shield may be of light stock. All unlabeled holes are 5/32" dia.

switch, on a bracket (fig. 3) at the rear of the chassis, with its shaft extending through a hole in the back of the cabinet. Drill only one mounting hole in the chassis for this bracket; the other mounting screw is already present. Put a shield (also fig. 3) between the two sections of S_1. No mounting holes need be drilled for the shield, since it fits existing screws. Drill a hole for the lead to L_3 in the chassis about ½" inside the left rear corner of the shield, and put a ⅛" i.d. grommet in it. Assemble S_1 extending through the hole in the shield and mount L_3 on it before attaching either the shield or the switch to the chassis.

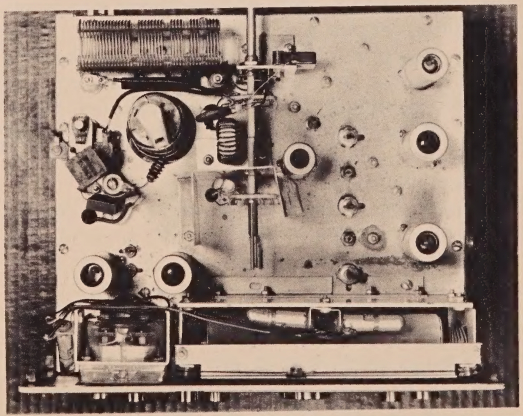
In the original design, drive to the final is controlled by detuning the driver plate circuit. This is effective, but leaves only the final pi network to prevent the v.f.o. frequency from appearing at the output. A pi network is very similar to a low pass filter, and passes frequencies below resonance readily, even though it rejects frequencies above resonance very well. A multiband antenna will radiate appreciable energy at the oscillator frequency as well as on the desired band. (This is the main reason Novices working on 15 m. are often heard on 40 and 20 as well.)

With the rig tuned up on 80, a monitor scope showed about a tenth as much output voltage on 160 as on 80. A similar output appeared on 40 when tuned up on 20. This means that on 80 and 20, the subharmonic output was only 20 db below the desired one. This is not serious with a mobile antenna which radiates efficiently on only one band. It is not acceptable for use with a multi-band antenna.

To reduce these spurious signals, I added a 100K pot to control the screen voltage of the driver. This allows the driver output circuit to be peaked, since the final grid current can now be controlled with this pot. This reduces the subharmonic output below readability on the monitor scope. There is just room to squeeze this pot into the panel, on the same level as the Spot control and 1 7/16" to the right of it.

As stated earlier, the v.f.o. operates on 160 for 80 and 160, but on 40 for other bands. The v.f.o. output appears across the same inductor on all bands, however. This results in much less drive to the buffer and the driver on 80 and 160 than on other bands. Since both these stages are grid leak biased, their plate dissipation was much higher on

(Continued on page 68)



Top view of the Cheyenne after conversion to cover 160 meters. S_{1B} and L_3 are mounted within the shield at the center of the chassis, while L_5 is supported from its leads from switch section S_{1A}. Notice the sturdy mounting bracket for S_1.

A "Countries Needed" List among DX Club Members can work wonders for DXCC Totals.

Thanks, I Needed That

BY STEPHEN K. THOMPSON, K4WVT

Somewhere between making DXCC and making the Honor Roll, every DXer reaches the point where it is harder to *find* new countries than it is to work them.

The frequent moments of accomplishment after working a new one become less frequent. And long hours are spent tuning around the bands, looking for something still unworked.

Members of the National Capital DX Association have found a way to help each other keep up the pace. It's called the Needed List, and it's dynamite.

The Needed List is a five-page register of who needs what. Each country is listed by prefix, followed by the calls of each NCDXA member who needs the country. The list is neatly typed and revised several times every year by our hardworking Secretary.

Everyone whose call is on the list keeps a copy in the shack. And if a 9Q5 puts in a sudden appearance on 20 meters, we know immediately who needs it. Word goes out quickly on our 2-meter simplex frequency, and any members who aren't monitoring receive a call on the landline.

Page one of the Needed list lists all members by call and name, and also gives their home and office telephone numbers. If a *really* rare one shows up in the middle of the work day, it's surprising how many members suddenly decide to take extended lunch hours.

W4UMF tells of the time he was at work, picking the brains of a highly-paid consultant when the call came. The consultant earned the rest of his fee in Ted's car, as W4UMF headed home to add a new one to his total.

WA3NGS was recently given ten minutes to compile a list of which NCDXA members could show up later that day for a schedule with South Georgia. Thanks to the Needed List, she didn't need to waste time calling around to see who needed South Georgia. She compiled the list in the prescribed ten minutes—and we're still waiting for the VP8 to show up.

Since having 100 or more countries confirmed is a requirement for membership in the NCDXA, there is no need to put the more commonly worked countries on the Needed List.

Our association's by-laws require that members be able to monitor our simplex frequency in order to be listed on the Needed List.

With NCDXA membership now pushing 50, there's a very good chance that, if a rare one shows up, *someone* will hear it and spread the word. In addition to helping our members work new countries they might otherwise have missed, the procedure keeps the members in contact with each other, and keeps the club active.

It's important to remember, however, that such an arrangement places you in the multi-operator category in some contests.

You need not be a member of a large DX club to make use of a Needed List—although it helps. Any two DXers can compile and exchange lists, provided they have reliable communications between their stations by radio or landline.

There's no excuse, at least in our club, for a member saying, "Gee, George, wish I'd known you needed Malawi, the guy was just up a few minutes ago."

With a Needed List, *you know.* ■

An Extract from the NCDXA Needed List

PYØ (P&P) ...	AFQ, DXO, EBY, EZT, HPF, IDG, KA, NGS, NHG, NL, OMR, WVT
PYØ (T)	COR, GHK, IDG, NHG, NL, WVT
S2	AFQ, CHP, DXO, EBY, EH, EJ, EXK, EZT, HPF, IDG, KA, NGS, NL, OMR, WVT, WWG, ZSR
ST	EXK, HPF, NHG, WVT
SU	CHP, EBY, NHG, WVT
SVØ (C)	AFQ, EBY, EXK, EZT, IDG
SVØ (D)	AFQ, EBY, EXK, IDG, NGS, NL, OMR, WVT

When is an amplifier a "Rheostatic Modulator"? And when is an oscillator a "Negative Resistance Black Box"? Follow along as "Professor" Gottlieb delves into "Philosophical Electronics" and explains that things are not always what they seem to be.

Seeing It Like It Is

BY IRVING M. GOTTLIEB, W6HDM

Unusually-keen discernment is not needed to recognize the often-contradictory viewpoints of the *technologist* and that fellow with the more-elegant solution—shall we, for want of more apropos nomenclature, label him the *philosopher*? Actually, these two interpreters of natural phenomena are generally so busy cultivating a mutual isolationism, that their divergent slants on how and why the world ticks may fail to reach the incipient stages of a good squabble. Indeed, "business as usual" implies that each begrudgingly tolerates the other from the privacy of his exclusive and overviewing vantage-point. This happens to be most unfortunate—a combo of these divergent intellects can provide directivity to science and engineering, and can replace the nebulous with more concrete matters for the philosopher to sink his teeth into. Rather than further indulge in a philosophy which, itself, risks becoming nebulous, the whole point will now be exemplified for the reader.

In fig. 1, we see a simplified schematic excerpted from a more extensive configuration. Essentially, what is depicted is a simple class "A" audio amplifier, together with its regulated power supply. There is really nothing noteworthy about this amplifier and its d.c. source. Amplification has been accomplished essentially in this way since the advent of the audion—and the mileposts of electronic evolution, such as the transistor, the FET, and the op-amp, haven't actually changed things, *philosophically*. Our amplifier remains what it always has been, a *rheostatic modulator!* What we do in our so-called amplifier, as any clear-headed *philosopher* would be quick to point out, is modulate the current from the power supply. Is this not so?

If the philosopher could temporarily turn technologist, he would seek a more-direct approach to amplification. We suspect he would endeavor to invent the device symbolically illustrated in fig. 2.

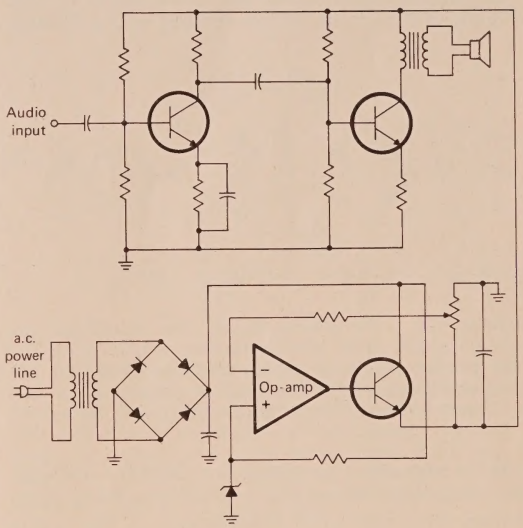


Fig. 1—A typical status-quo approach to amplification and d.c. supply. The philosophical query, "What are we really doing here?" can lead to something interesting—even practical!

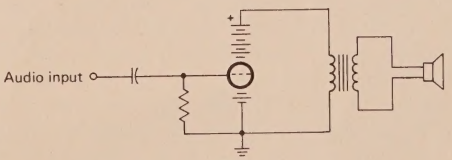


Fig. 2—Hypothetical device incorporating the philosophic view of amplification. The battery with a control grid has the current in its output circuit modulated by the audio input signal. Such an arrangement is inspired by what we see actually taking place when a conventional class A amplifier operates from a d.c. source.

This is a battery, or other source of d.c. power which, by means of its control electrode, is directly modulated by the signal to which we wish to impart amplification. Ideally, the input would demand no more current than the gate of an FET, or the grid of a tube. And, the output circuit would duplicate the input signal at a much-higher power level. Interestingly, devices poorly-approximating such behavior have made transitory appearances on the radio scene. Because they involved electrolytes, displayed lousy frequency-response during their limited life spans, and because they were bulky and costly, they did not endure. But that is *philosophically* trivial—if you are going to modulate a d.c. source, do it *directly* rather than with a sophisticated rheostat esoterically called an "amplifier"!

If we now inspect the somewhat strange circuitry shown in fig. 3, our brief prelude with the philosophic way of looking at things materializes as realizable hardware. Essentially, we see a current-regulated d.c. power supply feeding into a speaker

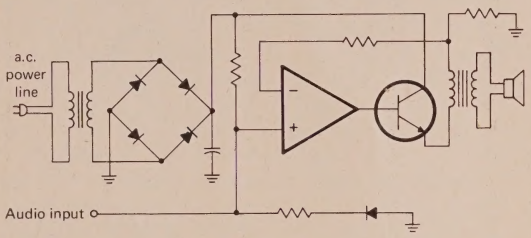


Fig. 3—The philosopher's fantasy: the modulated d.c. power source. Both audio frequency amplification and d.c. current regulation are accomplished with this circuit arrangement. For the sake of simplicity, the d.c. power connections to the op-amp are not shown.

circuit, and with the unique provision for modulating the reference voltage with the incoming audio signal. The current in the primary of the output transformer will vary about its quiescent level in accordance with the audio signal; the speaker voice coil will "think" it is being driven from an ordinary class A amplifier. Now, any class A amplifier is nought but a glorified (?) rheostat—but in this case, we have *dispensed* with all of the circuitry commonly designated "amplifier." Admittedly, we have invoked a concept resembling the old radio "reflex" idea where a single amplifying device handled diverse signals. But here, at least, we are not trying to accommodate microbe-power radio frequencies along with the audio. It appears that the usefulness of this scheme merely awaits implementation by the clever experimenter. Its application area could well be where it is important to squeeze blood from the proverbial turnip. Transceiver gear and portable equipment might be fertile territory for such an "amplifying power supply." It is relevant to note that the scheme does not merely convert a regulator into a linear amplifier—rather, it advantageously makes use of both of these functions.

This unorthodox philosophy of amplification should prove tailor-made for another interesting application. Assuming that amplitude modulation is not yet dead, it will be found that virtually all of the technical literature on the subject refers to the modulation of the class C r.f. power-amplifier. The philosopher, who is actually a superior nit-picker to the technologist, would voice his objection here. His clear perception of underlying causes, root reasons, and ulterior motives enables him to see it as it is. He would acknowledge that the class C stage gets modulated, to be sure—but *indirectly*. What we actually do is modulate the d.c. power supply!

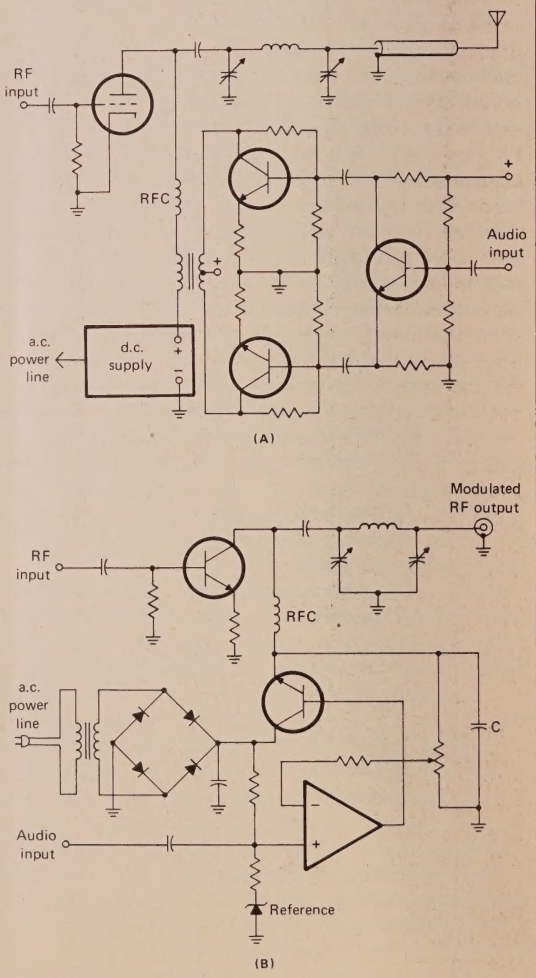


Fig. 4—The philosopher's approach to amplitude modulation. (A) The conventional way. (B) A more direct technique—a voltage regulator is modulated.

For example, in fig. 4A, the voltage developed in the modulation transformer adds to, and subtracts from the power supply voltage. One might contend this is just a different way of describing the same phenomenon. Although such argument is certainly valid, let's see what our divergent description can lead to.

From the foregoing philosophic allegations, the modulating scheme shown in fig. 4B might almost be anticipated. Here, a *directly* modulated voltage-regulator is used. Playing devil's advocate, a possible obstacle could be pointed out—the output capacitor, *C*, ordinarily employed to stabilize voltage-regulators against self-oscillation. However, if the loop gain is not astronomically high, and if the parts layout abides by good practices, this capacitor can be experimentally lowered to the extent that voice frequencies can be accommodated. No doubt, application will favor low-power transmitters, especially where a voltage-regulator already was incorporated in the design. A compelling feature, in any event, is that integrated-circuit regulators can be purchased for a couple of bucks or so, and op-amps are available for even less. Either device leads to a better regulator-modulator combination than could likely be designed with discrete elements. Note that considerable circuit simplification results from this unique approach. And last, but not least, the *elimination of the modulation transformer* should resolve that old compromise between preservation of low frequency voice components and making room for an out-sized iron-monster. Is this not a neat way out?

Having just touched upon the class-C amplifier, and with our philosophic instincts now fully awakened, it is only natural to take a deep hard look at this functional block of r.f. gear. And you can bet your nit-picking last dollar that this circuitry has long suffered from misplaced nomenclature. Suppose that you have just developed the world's first r.f. stage of this kind. It is very likely that you would draw up patent papers *not* on an amplifier, but on a "high frequency power-switch for shock-exciting a resonant circuit." With due modesty, it would behoove you to lament its considerable departure from ideal switching behaviour. For when you conceived the idea, you envisioned a switch that would create very narrow, rectangular current pulses—and one with exceedingly high Off impedance, but with near-zero On impedance. In your mind, you saw an agile knife-switch opening and closing at a radio-frequency rate. As a technologist, you were delighted that the scheme could be readily translated into hardware, and its rather imperfect switch-characteristics were relegated to the subconscious, or swept under the rug, as it were. But what tack do you suppose the "impractical" philosopher would take if presented with the same assignment?

The circuit of fig. 5 is configured about a newly-available thyristor, the RCA GTO silicon-controlled-rectifier. Unlike ordinary SCR's, this device can be tuned *off*, as well as on, by gate control. Specifically, a pulse, or d.c. level of 70 volts will extinguish conduction. Admittedly, tubes (or transistors) do not present us with turn-off problems. But, the arrangement of fig. 5 can approach the ideal switching operation we never have been able to get very close to in our traditional class C stages. (If you want to call this an "amplifier," such a designation would apply only in the sense that an electro-magnetic relay can be said to impart power "amplification" to its solenoid excitation.) In any event, it is not yet time to rush out and purchase a GTO device for the replacement of that thermionic energy-guzzler. The switching rate of this long-sought thyristor is limited to the upper audio frequencies, and the output stage of fig. 5 may delight the philosopher, but it can only frustrate the technologist.

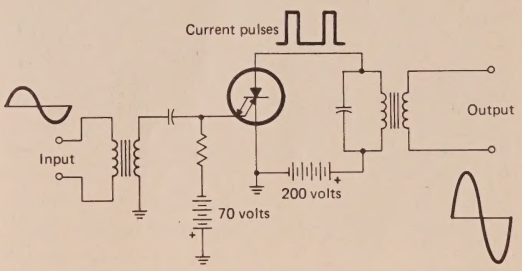


Fig. 5—A power booster making no pretense as an amplifier. A gate turn-off SCR is utilized. It functions as a near ideal switch for shock exciting the resonant circuit with narrow rectangular current pulses. Unfortunately, the present state of the art precludes such use at Ham frequencies. The circuit shown is intended to demonstrate the feasability of the switching concept—at about 15 kHz.

It may very well portend things to come, however. Relevantly, SCR's are presently used in powerful low-frequency inverters for induction heating in industrial processes.

Finally, let's touch upon the touchy subject of *oscillators*. It is interesting to contemplate all of the different types of oscillators that have been used for amateur radio. With regard to all *LC* types, three oscillation-producing mechanisms have been involved—or so, the good books inform us. These are *feedback, shock-excitation,* and *negative resistance*. A sharp mathematician can show that all oscillators can be thought of as "black box," which present *negative resistance* to the tank circuit. Admittedly, this is not always easy to reconcile with previous notions we may have cultivated. Suggestive proof that this is so, is the spontaneous and

persistent oscillation of resonant tanks in which temperature has been depressed to cryrogenic levels, thereby reducing losses to a negligible level. The common message seemingly is that oscillation accrues when one removes the effects of dissipative losses. This being the case, why horse around with amplification, feedback, and pulse generation in order to provoke that interchange of electric and magnetic energy in the tank circuit? *Philosophically,* the more direct approach would be to simply associate a negative-resistance device with the tank, then stand back and let nature take its inevitable course.

Such an idea is far from new — this has been done with arcs, with dynatron, transistron, and phantastron tube circuits, and of course, with the *tunnel diode.* But all of these devices and techniques left something to be desired in the way of practicality and reliability. An acceptable negative-resistance device must be simple to implement, predictable, and must have stable characteristics with respect to temperature and aging. The tunnel diode looked good for awhile, but it does not readily match with practical *LC* tank circuits, and its negative resistance region is not sufficiently well defined unless you utilize only a small mid-portion of its slope. Moreover, it is too power supply dependent, and can operate in more than one mode of oscillation. So, we stuck with our tubes and transistors, deploying them in sure-fire feedback configurations. But the philosopher never relinquished his desire for a nice two-terminal device which could snuggle up to a tank and make it purr.

At long last, it appears that such a device has been developed in the form of the *Lambda diode.* It is for shame that you or I did not create it, for it actually comprises nothing more sophisticated than a couple of FET's in intimate consort. The symbol, and the nature of this device are illustrated in fig. 6, as well as its characteristic. Of course, the available item is superior to anything we could now produce with discrete FET's, inasmuch as it is fabricated as a monolithic module, and its operation has been optimized during its processing.

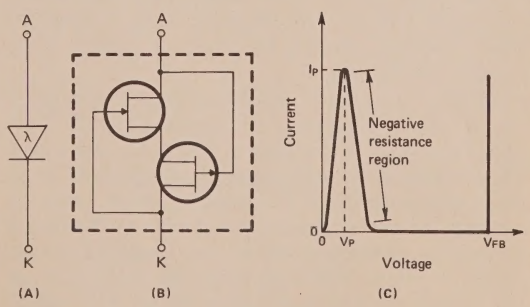


Fig. 6—The Lambda diode. (A) The symbol of the Lambda diode. (B) Internal circuit of the Lambda diode. (C) The current-voltage characteristics of the Lambda diode.

While we are going to make a philosophically-simply oscillator, we may as well try to produce one that is technologically good enough to be used as an v.f.o. for Ham rigs. One of the basic requirements of a good v.f.o. is that load variations do not disturb the generated frequency. If the reader is a vintage peer of the author, it may be recalled that the electron-coupled oscillator once performed pretty well in this respect. It displayed the property of *unilateral coupling*—you could couple r.f. out of the oscillator, but could not couple the effects of inductance and capacitance back into the tank circuit. It may have been unfortunate that the tube companies failed to develop a tube specifically optimized just for this function. As it was, the construction of a really good electron-coupled oscillator depended too much upon the skill of the constructor. But the basic *philosophy* of unilateral coupling was quite sound. Until relatively recently, no solid-state device has been available by which we could simulate unilateral coupling.

The popular opto-coupler has excellent, but not obvious, potential as a means of coupling r.f. strictly in one direction. The prime reason this device is not appearing more rapidly in "linear" applications is that the manufacturer's have gone hog wild in optimizing it as a pulse-transferring interface between computers and their peripheral equipment. However, when you design for faithful reproduction of high-speed pulses, you inadvertently also produce a device capable of handling high-frequencies. The really neglected feature is linearity. Fortunately, that is not of first-order importance to the innovation ahead. In fig. 7 we see several versions of opto-couplers. All of them make use of an LED "transmitter." Usually, the important spectral portion of its emission is in the infra-red

(Continued on page 69)

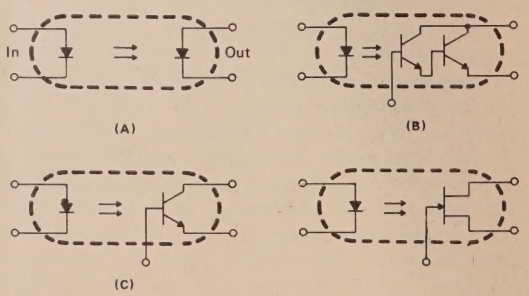


Fig. 7—Several versions of the opto-isolator. Although the manufacturers of this unique device are not yet awakened to its potential in linear and r.f. applications, some interesting and useful circuits have been investigated by experimentally-oriented Hams.

CQ Reviews: The Tempo VHF/ONE 2 Meter FM/SSB Transceiver

BY HUGH R. PAUL, W6POK

HENRY Radio has introduced some very popular pieces of Ham gear in the past few years. Their latest entry, the Tempo VHF/ONE is novel in it's design concept and may prove to be one of their more successful efforts. The basic unit as illustrated, consists of an all solid state 2 meter f.m. transceiver, featuring LED digital frequency display.

The entire two meter band is covered by means of a phase locked loop synthesizer, tunable in increments of 10 kHz, with a switchable + 5 kHz offset for split channel use. Plus or minus 600 kHz offset is also provided for repeater operation.

Transmitter power output is rated at 10 watts on f.m. or 8 watts PEP on s.s.b. That's right, this little rig will also work s.s.b., provided you purchase the s.s.b. adaptor, which plugs into the side of the unit. The adaptor will be available by the time you read this article and we plan to review it at a later date.

While I have not seen the s.s.b. adaptor, I have examined the schematic and it looks very good. Provisions are made for RIT and a.l.c. The combination should be competitive, performance—and price-wise, with those units on the market offering both f.m. and s.s.b. modes.

The use of an outboard s.s.b. adaptor might not appeal to all, but for the dedicated f.m. operator who purchases the transceiver and then later gets the yen to try s.s.b., it's less costly to buy the adaptor, than trade the transceiver in for one providing both f.m. and s.s.b. modes. In my particular case, I prefer f.m. for mobile use and s.s.b. for OSCAR from the home QTH. The transceivers currently on the market, which provide both modes, are too large to mount conveniently under the dash of my Pinto station wagon. The Tempo VHF/ONE, measuring approximately 7" wide, 2¼" high and 9½" deep, without the s.s.b. adaptor, fits quite nicely. Those of you who drive the sub-compacts may find this design approach most desirable.

Construction

A two piece vinyl-covered steel cabinet, held together with four screws, houses the transceiver.

The Tempo VHF/ONE 2 meter f.m. transceiver offers s.s.b. operation with the addition of an optional adapter. The rig is fully synthesized and uses an LED display for frequency readout. (Photos by Sandra K. Paul)

The attractive front panel is high impact plastic, similar to that used by a number of other manufacturers.

The operating controls are conveniently laid out for mobile operation and from left to right are as follows: Two large concentric knobs for selecting 100 kHz and 10 kHz band segments. A smaller knob for selecting 1 MHz segments from 144 MHz thru 147 MHz, plus the two crystal controlled channel positions. The squelch control is next and when pulled out, shifts the selected frequency by plus 5 kHz, thus allowing you to cover the new split repeater channels.

The LED frequency display does not indicate the 5 kHz shift. Instead, a small LED indicator lights in the upper right corner of the display panel.

On several occasions I was told that my audio was poor and I then realized that instead of operating on 146.820 MHz, I was actually on 146.825 MHz. I try not to ignore red lights, but apparently this one isn't large enough.

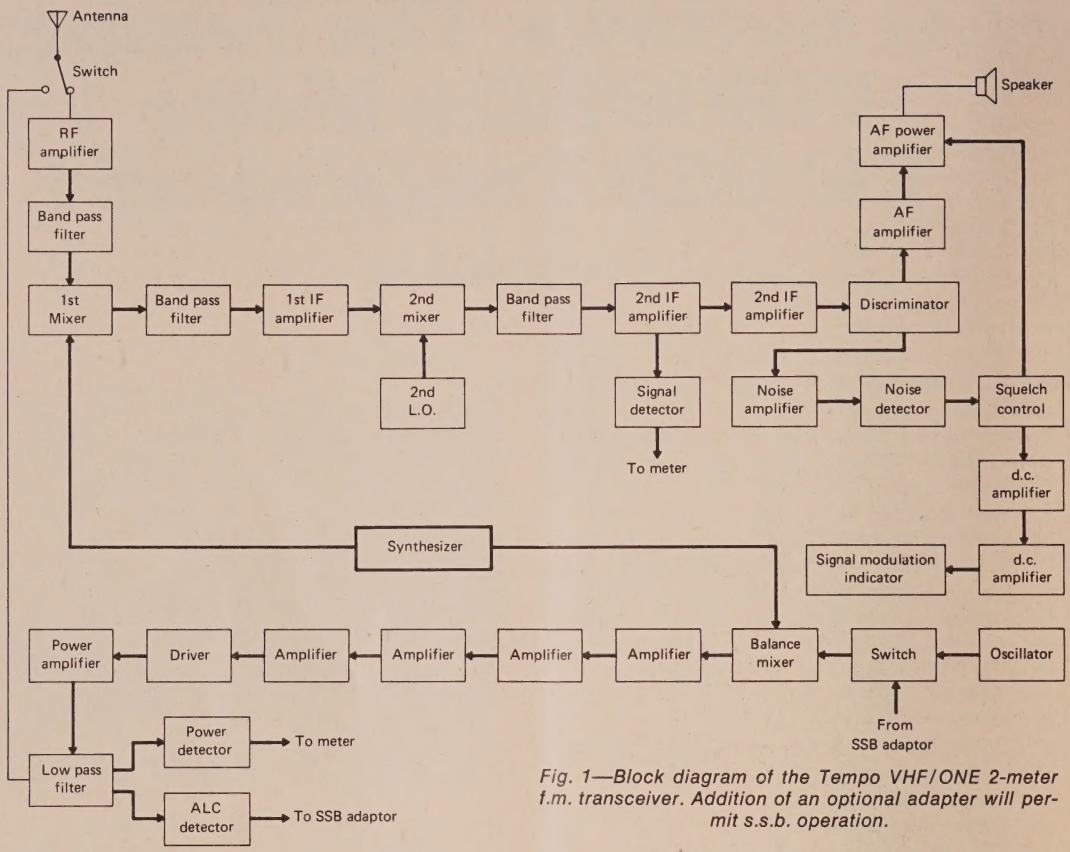


Fig. 1—Block diagram of the Tempo VHF/ONE 2-meter f.m. transceiver. Addition of an optional adapter will permit s.s.b. operation.

There is another red LED in the upper left corner of the display area, which indicates when the transmitter is on. Just below this is a green LED to indicate channel activity. Next is the combination off-on switch volume control, followed by a miniature toggle switch to select plus or minus 600 kHz transmit offset or simplex. A back lighted meter with a scale reading 0 thru 10 gives a relative indication of signal strength and transmitter power output.

At the time I tested the VHF/ONE, Henry Radio had not yet received the first production run. The operator's manual had not been printed and I was restricted to the use of a schematic that was several generations removed from the original. Not all of the component designations were legible and time did not permit me to search them out in the transceiver itself. Block diagrams of the synthesizer and the receiver-transmitter sections are included here and should be adequate for overall design analysis.

Henry has always been very good at providing adequate information in their operator's manuals and I'm sure that the manual for the Tempo VHF/ONE will not prove an exception.

As can be seen in the photograph showing the main circuit board, component placement is such that maintenance, if required, can be readily accomplished. The diode matrix board can be seen just to the right of the main circuit board, as can the back of the LED digital readout board. The displayed digits are 5/16" high and red in color. While they are easy to read, I would prefer green. For some reason red has always been irritating to my eyes. I made the same complaint to another manufacturer at a convention earlier this year. He informed me that he had heard that complaint voiced on several occasions, but in surveying amateurs on the matter, the majority preferred red.

The synthesizer circuit board is mounted in an aluminum box, beneath the main circuit board. It too, is reasonably accessible for service.

Synthesizer

The synthesizer is a straight forward phase locked loop system. The reference oscillator is crystal controlled at 5.12 MHz, then divided by 2 and then twice again by 1/16 to produce 10 kHz.

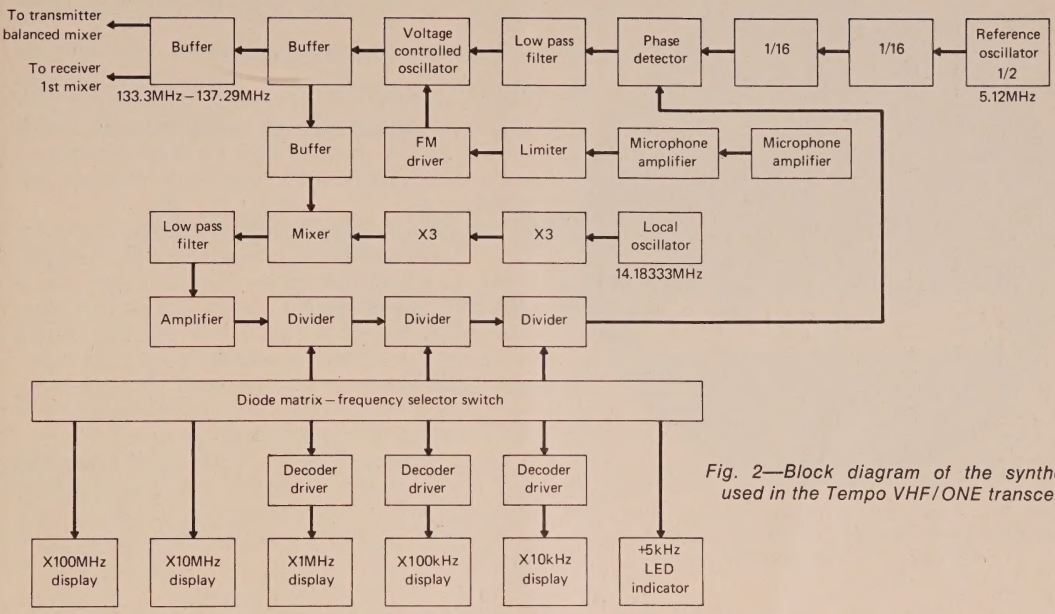


Fig. 2—Block diagram of the synthesizer used in the Tempo VHF/ONE transceiver.

The location oscillator is also crystal controlled at 14.18333 MHz, multiplied 9 times and mixed with the output of the voltage control oscillator, which operates from 133.3 MHz to 137.29 MHz. The difference signal output from the mixer is then injected into the 1/N divider chain, where it is divided by selected ratios to produce 10 kHz.

The 10 kHz derived from the location oscillator and the 10 kHz derived from the reference oscillator are then compared for phase. The phase detector produces an output voltage proportional to the phase difference of the two 10 kHz signals. This correction voltage is then applied to a Varicap diode in the voltage control oscillator.

While it was not noticeable in operating the rig, it was determined by measurement that both the transmit and receive frequencies were about 950 Hertz high at turn on and required about thirty minutes to drift down to the indicated channel frequency, after which it settled down quite nicely. Since both the transmit and receive frequencies were drifting by the same amount, it would appear that the drift was occurring in the synthesizer. While the measured drift is not enough to be noticed, except under weak signal situations, it does appear to be high for a phase locked loop system. This fact was mentioned to Henry and they indicated that production units would be checked carefully for drift.

Receiver

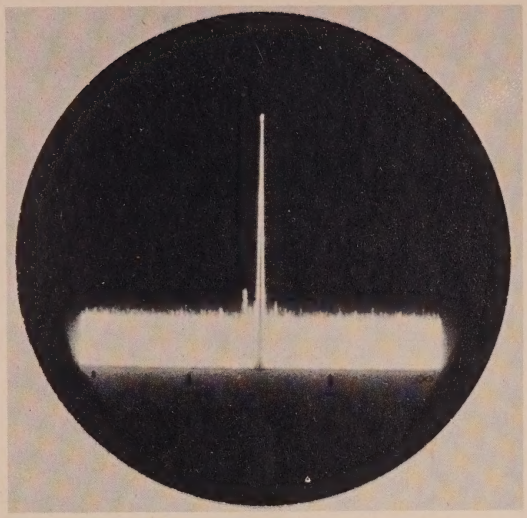
The receiver section employs double conversion, with a first i.f. of 10.7 MHz and a second i.f. of 455 kHz. Field effect transistors are used extensively. A 3SK41 dual gate MOSFET is used for the r.f. amplifier and exhibits a high resistance to cross-modulation.

Following the r.f. amplifier is a three section helical band pass filter. The first and second mixers utilize 2SK19s, as does the mixer for the location and voltage control oscillator signals in the synthesizer.

Complete specifications for the i.f. filters were unavailable. The 10.7 MHz i.f. appears to be using a single section crystal type. The 455 kHz i.f. filter is easier to identify, being one of the series of four section ceramics, manufactured by Murata. This filter has a bandwidth of 12 kHz at −6 db.

The overall bandwidth of the Tempo VHF/ONE is specified as 12 kHz at −6 db. In comparing the transceiver with a couple of others rated at 15 kHz at −6 db, it was noted that the others exhibited some intermodulation when listening to one of the new split channel repeaters, while the VHF/ONE was clean. The two repeaters separated by 15 kHz, both put signals of about 50 microvolts into my QTH. A little extra selectivity can be a big help.

If I may take a moment, I would like to make a statement regarding intermodulation. Listening on the various repeater frequencies in Los Angeles, you quite often hear conversations relating to intermod problems. It seems like a number of Hams are continually searching for a receiver that's completely immune to this type of interference. My friends, there is no such piece of gear on the market.



Spectrum analyzer display of the output of the VHF/ONE transceiver. The spur to the left of the carrier is −48 db about 5 MHz below the carrier.

If you can look out your window and see a repeater sitting on the hill running 100 watts output and you are trying to work through another repeater 20 miles away, which is removed in frequency by 15 kHz, you have a problem. Even if your receiver bandwidth were 7 kHz at −6 db you can experience intermodulation. Proper design can reduce the problem, but cannot eliminate it under all circumstances.

Some manufacturers advertise a db figure for cross-modulation and inter-modulation. These figures mean nothing without some test specifications. How many kHz removed from the desired signal is the undesired? What is the level of the desired and undesired signals? These are just a couple of the parameters needed to lend some meaning to such figures.

Receiver audio is rated at 1 watt with 10% distortion. The audio level and quality is good with the built in speaker. Provision is made for an external speaker and would prove desirable in some mobile situations.

If you wish to meter the discriminator output, you will find it brought out to the auxiliary socket on the back of the transceiver.

Squelch opened with .15 microvolt applied. The action is positive, but can still be opened by the stronger repeaters, at the full "on" position. Receiver sensitivity is excellent, averaging .25 micro volt for 20 db of quieting, across the band.

Transmitter

Modulation is direct f.m., as a result of reactance modulating the Voltage Control Oscillator in the Synthesizer. Deviation is adjustable from 0 to 10 kHz.

The output from the synthesizer is mixed with the transmitters 10.7 mHz local oscillator in a balanced mixer using four 1S2187 diodes. You will note from the block diagram that the mixer is preceeded by a diode switch, which in the s.s.b. mode would feed the s.s.b. signal from the adaptor to the balanced mixer.

There are five stages of amplification prior to the power amplifier, which is designated on the schematic as a 2SC1729, but in the unit tested was a 2SC1605. Power output varied across the band from a minimum of 13.2 watts to a maximum of 14.2 watts, with 13.8 volts d.c. applied to the transceiver.

A 1N60 diode in the harmonic filter section, serves as a source of d.c. to give an indication of relative power output on the meter.

There appears to be no provision for protecting the power amplifier transistor from the effects of operating into a load with high s.w.r. I didn't try a direct short, but did run the transmitter into a load with an s.w.r. of 5 to 1 for quite a period of time. No ill effects resulted from this test.

Spectrum analysis was run with a Hewlett Packard 851 analyzer. The highest level spur, which can be seen in the photograph just to the left of the carrier, was a −48 db from the carrier level. The analyzer was adjusted for 10 MHz per division, so the frequency of this spur is around 5 MHz below the carrier. Other spurs that can be seen in the photograph are better than 55 db down from the carrier. While not photographed, the harmonics were displayed on the analyzer. The second harmonic measured −33 db below carrier level.

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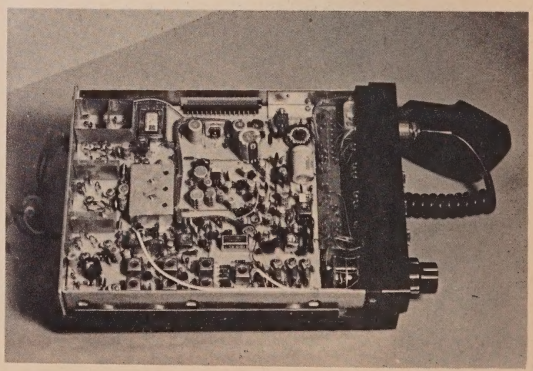

The Tempo VHF/ONE is readily serviced since a single PC board contains most circuitry. To the right of the main board can be seen the diode matrix board, while the LED display board is hidden by the front panel escutcheon.

Although intended mainly for Novice use, the popular HW-16 c.w. transceiver by Heathkit makes an excellent primary or backup rig for higher class licensees. The simple changes described here put it on 20 meters, too, in addition to the standard 80, 40 and 15.

Adding 20 Meters to the Heath HW-16

BY SAM CREASON, WA6LSL

The Heath HW-16 is a good rig. After being QRT for several years, I found that it provided a good way to get back on the air. It does have some shortcomings, though. It lacks a v.f.o. and coverage of 10 and 20 meters. V.f.o.'s can be found, and at least during this portion of the sunspot cycle, 10 meter coverage isn't all that important. But 20 meters is my favorite band. By giving up 15 meter coverage, it's rather simple to substitute 20 meter coverage [1, 2]. Since I didn't want to do that, the only solution was to add a position on the bandswitch to accommodate 20.

A brief study of the schematic in the instruction manual will show that eight functions must be switched when changing bands. Since four bands are to be covered, a nonshorting, eight-pole, 5-position rotary switch with two poles per deck was used. The switch was obtained from the local surplus store, but can easily be duplicated with commercially available phenolic or ceramic hardware.

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[1] "Putting the HW-16 on 20 meters", *QST*, August, 1972, p. 51

[2] "Modifying the Heath HW-16 from 15 to 20 Meters", *QST*, November, 1975, p. 35

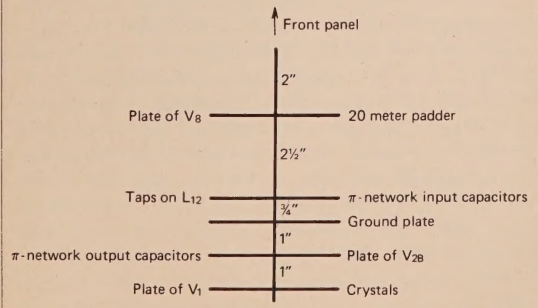

Fig. 1—Functions and spacing of the bandswitch sections of the Heath HW-16.

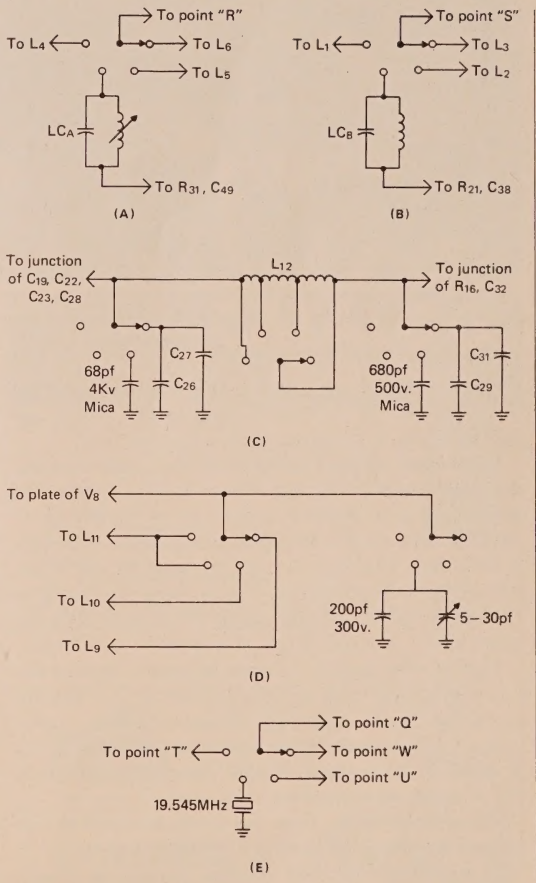

Fig. 2—Connections to HW-16 bandswitch. Existing components bear numerical designations. LC_A is 18 turns #30 on ¼" slug tuned form (Miller 20A000RBI) shunted with a 27 pf 300 v. mica capacitor. LC_B is 13 turns #30 on similar form, shunted by 56 pf 300 v. mica. L_{12} is tapped halfway between 40 and 15 meter taps, on opposite side of coil.

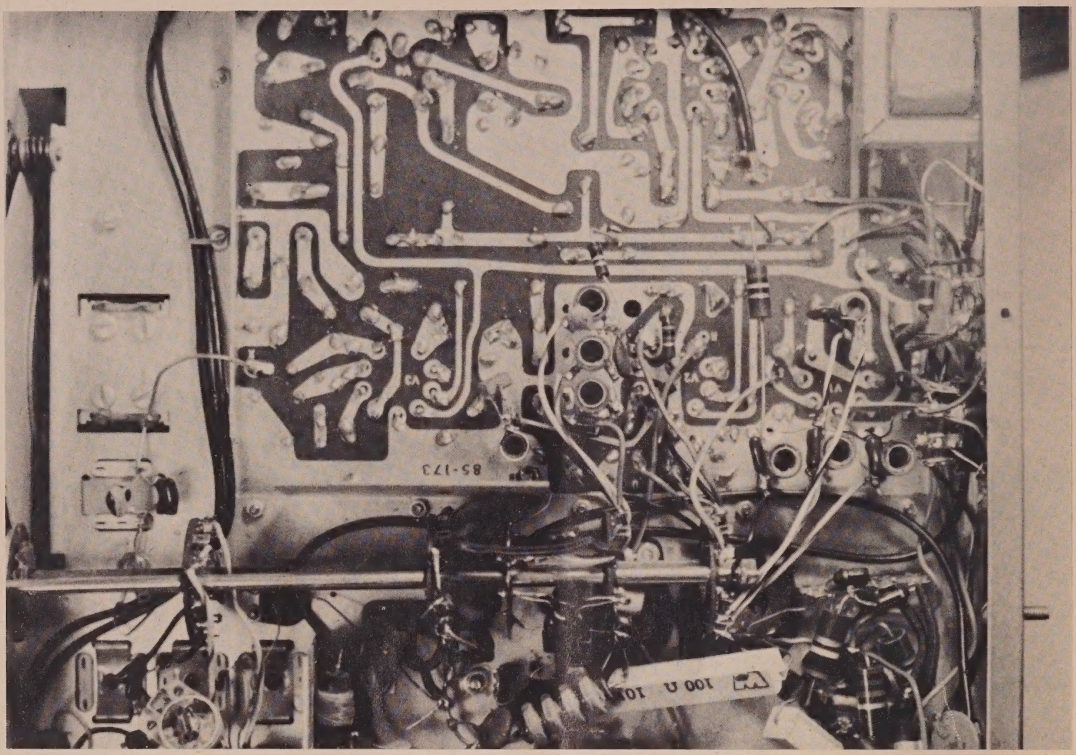

Fig. 3—Bottom view of the HW-16 showing the bandswitch area after modification for 20 meter coverage. Detailed description of the changes is given in the text.

The functions and the spacings of the sections are shown in fig. 1. Connections to the switch are shown in fig. 2. A photograph is shown in fig. 3.

Both poles of the front section are used to select the plate load of V_8, the driver. No new coils are needed, but a padder capacitor is switched in parallel with L_9, the 15 meter coil, when 20 meters is selected. The padder can be seen in the lower left of fig. 3. Any combination of fixed and variable capacitors which covers about 210-225 pf is satisfactory.

The second section is used to select part of the π-network. One pole selects the tap on L_{12}. The remaining pole is used to select the input capacitor. The parallel combination of C_{26} and C_{27} is used on 80 meters. A new capacitor, similar to C_{26}, is used on 40 meters.

The ground plate from the original band switch is used for the same purpose in the new switch.

One pole of the third section is used to switch the output capacitor of the π-network. The parallel combination of C_{29} and C_{31} is used on 80 meters. A new capacitor, similar to C_{31}, is used on 40 meters. The remaining pole is used to switch the plate load of V_{2B}, the heterodyne oscillator of the receiver. It might be possible to simply switch a padder in parallel with L_1, the 15 meter coil, but I chose to use an additional slug-tuned coil. It appears near the center of fig. 3.

One pole of the rear section is used to select the plate load of V_1, the r.f. amplifier of the receiver. Again, an additional slug-tuned coil is used, and can be seen near the right center of fig. 3. The remaining pole is used to select the crystal for V_{2B}. It's mounted, using a socket, between V_2 and the 26.545 MHz crystal. One pin should connect to the foil on the PC board. The other should come through the board where there is no foil. It can be secured by flowing a large blob of solder on it.

The external connections to the switch should be made in the form of pig tails, the other ends of which are connected after the switch is in place.

After the wiring is completed, the receiver and transmitter should be realigned per the instruction manual on 80, 40, and 15 meters. Note that if the positions of the bandswitch are wired as shown in fig. 2, the position marked "21.0" on the panel will be 20 meters. Alignment of the receiver on 20 meters consists of adjusting the new oscillator coil until an increase in background noise is heard, in-

(continued on page 70)

Calibration Control for the Heath HW-16 Transceiver

BY DAVID VAIL, VE1AKQ

The Heathkit HW-16 transceiver has proved to be a popular little rig, both with Novices and more advanced operators. One shortcoming of this rig is that no provision is made for adjusting the receiver dial to zero-beat with a crystal calibrator. If the receiver is aligned so that the dial reads correctly at 3.5 MHz, it will be found that the zero-beat falls at a slightly different dial setting on the other bands, (in my case, at 7.003 and 21.008 MHz). Fortunately, this situation is easily remedied by the addition of a small variable capacitor, which is connected in parallel with the receiver tuning capacitor. The value of the calibration capacitor need be only a few picofarads. The one which I used was salvaged from a junked "Command" receiver i.f. transformer, and all plates were removed, except for two stators and one rotor.

One terminal of the calibration capacitor is connected to chassis ground through its mounting screws, and the other terminal is connected to one of the ungrounded terminals of the receiver tuning capacitor by a length of heavy, solid wire. The capacitor, being small, is easily mounted on the front chassis apron, between the transmitter tuning and bandswitch control shafts. The shaft of the calibration capacitor goes through a 5/16" hole drilled in the front panel, and a small knob is placed on the end of the shaft.

For convenience in using an external crystal calibrator, a phono jack was installed on the rear chassis apron, and connected to the antenna terminal. To avoid having to unplug the calibrator when transmitting, it was necessary to place a switch in the calibrator's output circuit, to isolate it from the transmitter's radiated power.

When installation of the calibration capacitor is completed, set its plates at the half-meshed position. Plug in the external calibrator, and tune the receiver for zero-beat at the bottom end of each band. Don't be alarmed when the calibrator signal shows up above the zero mark on the dial. This is due to the capacity which you have added to the receiver v.f.o. circuit. Take note of the dial settings where the zero-zeat appears on each band, and jot down the three dial settings. With the calibration capacitor still at half-mesh, select the band with the "middle" of the three settings. Tune in the calibrator

(continued on page 70)

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ADRIAN WEISS, K8EEG, ON

QRP

My head still aches to think of FD 1975 at the usual K8EEG site! Nothing went wrong—except! Well, to make a long story short, the 8JK went up with polished ease, temperature was just right, a new cooler kept the drinks and food ice-cold, nice breeze on a clear day. To top things off, this was the first outing with commercial equipment—an Argonaut and AC-5 tuner. What a difference in operating comfort in comparison to past years, all of which involved homebrew discrete receivers and transmitters. Just one knob to twist in making contacts! And the CWF-2 filter making each signal sound like the only one on the band. I was really living—for the first few hours. Things on 20 and 15 were pretty good, but not really hot, and I was managing about 18 QSO's per hour. Not even working at it!

Then the problem showed up. The windmill tower which served as the 8JK support sits at the edge of a hay-field. I'd noticed that the hay had been cut recently, but didn't give it a second thought—until the tractor and baler appeared on the field—downwind from the shack. That was about 1800 local time. By the time the farmer had cleared half the field (all downwind, remember), K8EEG's cranium began throbbing with pain at every dot and dash hitting the phones or speaker. Hay-fever migrain. I kept reminding myself that it was a simple matter of "mind over matter," but it just didn't work. Nor did the towels that I repeatedly soaked in ice-water and draped around my head. 20 was going wide open at about 2200 and I was racking up about 28 contacts per hour when the urge to regurgitate became overpowering. Rather than mess all over the Argonaut, I hit the hay (sick pun!) for the night. Drats! I knew I had at least 400 contacts in the bag if only I could have stuck it out. The only sense I can make out of it is to echo Donne's famous line "Ask not for whom the bell tolls . . ." by adding "the baler rolls for thee (K8-EEG!)" Not everyone had it so good!

Take **Slim, WB9NOZ** who writes the "Murphy" for the year: "FD '75. Wow! Finally talked the club into it, went under the club call and was the only c.w. operator. I was going to run the Argonaut from lantern batteries, but decided at the last minute that I better take the one out of the car. I wired the damn thing backward, the Argonaut didn't have diode protection, so there struck Murphy on my very first Field Day! So I drove home (about 30 miles) and picked up the Drake twins and ran at 4 watts output. Boy you wouldn't believe the guys that came around and checked the wattmeter to make sure I was honest! They were squawking about running low power (200 watts) and then couldn't believe I was working those CA stations on 4 watts. I stuck it out all night and finally gave up about 1100 the next morning. But sure was fun and next year will have diode protection for the Argonaut."

WØOGJ was stricken by mountain-topping fever and reports: "I had been active with QRPp for about a month before FD. Ever since I was a Novice, 14 years of age, I had wanted a portable amateur radio station that I could set up in remote locations and operate from batteries. So the HW-7 was the perfect piece of equipment and FD was the perfect opportunity. I checked out some Forest Service maps for mountain peaks about 11,000 ft. in elevation. That is timberline level in Colorado and I needed trees for antenna supports. The peak I selected was located in national forest land about 40 miles west of Denver. Access was convenient and I checked out the location beforehand. The terrain near the top of the peak was rocky, with a consistent slope of 35-40 degrees. I enjoyed a beautiful view of the Rockies from my spot, and the only problem was a tendency to roll downhill while sleeping. There were many fine 50-60 ft. trees.

To use these trees as antenna masts, I took along my bow, arrows, and spinning rod and reel. I stuck the rod in the ground pointing toward the target tree, and tied the 8 lb. monofilament fishing line to the arrow (through a small hole I'd drilled at its base). The arrow pulled the monofil through the branches at the top of the trees with no problem. Then a heavier nylon cord was attached to the end of the monofil and hauled over the trees. It was then a simple matter to hoist the antennas with the nylon cord. Think of what you could do with California Redwoods! My 40 lb. bow could have easily gone to a hundred feet—perhaps higher! The spinning rod-reel combination helps with the higher trees.

Results:
1975 Milliwatt Field Day Trophy Contest

		QSO's (c.w./s.s.b.)	PWR Mult	Batt Port	Score
1.	WB8OSM	220(54/166)	4	X	1470
2.	K8EEG	211(125/86)	4	X	1416
3.	WØOGJ	182(182/—)	4	X	1242
4.	WA3UDS	137(137/—)	4&5	X	1153.5
5.	WB9LGZ	130(130/—)	5	X	1125
6.	WB9NOZ	234(234/—)	4		1086
7.	W2CRS	138(55/83)	4	X	978
8.	WAØAGN	133(74/59)	4	X	948
9.	W8MOP (K8BHG)	126(126/—)	4	X	906
10.	W6BXN (K6TG)	126(126/—)	4	X	906
11.	WB9LKC	118(31/87)	4	X	858
12.	WA6YPE/ WA6MCL	70(70/—)	4	X	570
13.	WB2DLA	27(27/—)	4	X	312
14.	K4BNI	76(76/—)	4		304
15.	W4AWS	37(37/—)	4		222

Multioperator/Transmitters

1.	WØMHK(4)	336(159/177)	4	X	2166
2.	K1GAX(4)	342(268/74)	4	X	2052
3.	W3FQR(10)	243(201/42)	4	X	1608
4.	W3AI(7)	126(126/—)*	4	X	906

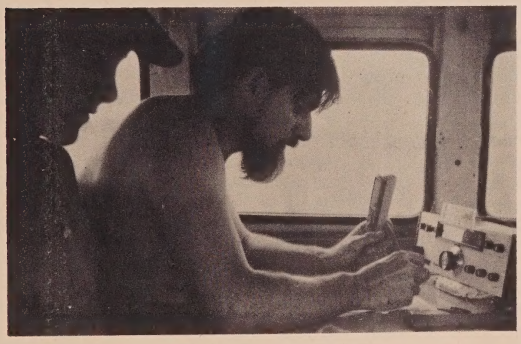
(Scoring: Total QSO's × Power Multiplier (×4=5 watts, ×5=1 watt, output) × 1.5 Battery + 150 Bonus (completely portable setup away from home QTH). *W3AI SSB QSO's disqualified because exceeded power limit.)

I used a 20 meter dipole and another which served both for 40 and 15 meters. I worked about 16 hours of the allotted time. It was a solo expedition, so I did all the operating and logging. I sat on a log with the HW-7 in front of me on the ground, and my paddle on my knee. I was off the air for a few hours in the late afternoon when an electrical storm blew over. I felt very vulnerable that close to the top of the peak with all that wire strung up, so I lowered the antennas for a while. I had a couple of bluejays that hung around looking for handouts to keep me company. Never have had a better time hamming!"

Some other comments. **WB9LGZ:** "Antenna was a 2 wave Vee at an angle of about 30 degrees, 15 ft. up. Contacts were up by an unbelieveable 6450% over my effort last year (2 QSO's)!" **WB2DLA:** "All equipment used is homebrew. The receiver: a regenerative-superhet run from a pair of D cells and a 9 volt transistor battery. Transmitter: 2N3-919 final running 5-watts input on 24 volts worth of D cells. Separate receiving and transmitting antennas, each only about 10 ft. high and strung between trees about 60 ft. apart. All 27 QSO's were made on 80 c.w. between 0624-0930 EDST of Sunday morning. I have found that the 80m boys tend to give QRPp stations a break." **K8BHG:** "I almost didn't get any FD in as the XYL got sick and had to rush her to the hospital shortly before FD began. She got to feeling better so I took off for the site and got to operate periodically what with running back and forth between the site and the hospital. I did manage 126 QSO's on 40 and 15m though. I used the Argo with lantern batteries. Our club sponsored the outing and had several QRO rigs running simultaneously. My Argo was the only QRPp rig used and did well compared to the QRO set-ups. I was anxious to see what I could with the low power on FD. Everyone had favorable comments on the Argo and how it worked and were surprised by the results. I had a good time despite the side-effects and am looking forward to next year when I can plan a better antenna system. **W2CRS:** "I used the Argo, AC-5 and a 180 ft. long wire up 20-25 ft. (and lost two arrows trying to get the thing up higher!). Very poor ground—a copper pipe about 5 ft. in the ground (smashed my thumb with a sledge-hammer while trying to get it in farther, and then didn't have enough strength to pull it out and try again!). I was literally in an uncut field 100 yds. from the St. Lawrence river. The "hay fever" and bees during the day were bad, but the mosquitoes at night were terrible!" K6TG was out in the VW again (see June, 1975 column for pix) with his Argo. His 126 QSO's won him the Turlock A.R.C.'s Trophy at the club's annual picnic for having made the highest FD score in the club! **WA3UDS:** "Our plan was to operate from the Churchville Elementary School, a high point about 20 miles north of Philadelphia. Murphy struck early, destroying the finals in the PM3A. We ended up using the HW-7 through an AC-5 coupler to a 212 ft. twin-lead fed dipole system with the center at 40 ft. and ends at 8 ft. The entire system, including tower, guys, dipole, and feedline weighed less than 151 lbs., and survived several storms during FD with no trouble. We had to suspend operations for a total of six hours due to intense electrical activity when ½ inch sparks began jumping off the end of the feedline. (We did prove that Ben Franklin's 200 year-old experiment was valid.) Despite Murphy and the weather (two inches of rain in 8 hours preceding the contest), we managed 137 QSO's, smashing WA3UDS's 1974 record of 3 QSO's!"

That about wraps FD 1975 up fellows. Scores were good this year. Improving all the time. The competition for the Milliwatt Field Day Trophy 1975 appear elsewhere in this column.

This "cool" set-up is deceptive: actually the site is located in the Mojave Desert! If that isn't strange enough, note also that it is on a small island in a Catfish pond in the desert! Now that makes for a challenge. WA6YPE notes "that's what it is all about for us. It was our first contest effort of any kind." Nice way to start, eh! Note the "Murphy-ed" HW-7 with top removed at bottom right. That's WA6MCL looking calm and collected at the key.



WB9LKC at the mike. Notice that an Argonaut has replaced Ray's PM-2 plus deluxe box shown in a pix in the January, 1975 column. He still looks the same though!

NOTE: The Milliwatt

Many readers of this column who are also subscribers to *The Milliwatt* have been perplexed, frustrated, and perhaps angered by my failure to respond to repeated correspondence inquiries about the journal. I have been unable to attend to the business of publishing the magazine and handling correspondence since summer for a variety of reasons all beyond my control—extended illness, teaching load, marital difficulties etc. My heart is still with the project, but until I can manage to get my stamina back, I'll have to suspend publication until future notice. An attempt will be made to return mail that has accumulated. Be patient, please. Until next month,

73, Ade, K8EEG/Ø

WILLIAM I. ORR, W6SAI, ON

Antennas

"Well, friend Pendergast, what do you think of the new, larger size of *CQ* magazine?" I asked.

Pendergast looked up from his reading with a smile and replied," Its great! I like it! But I must admit that the pages aren't as soft as the old *Sears, Roebuck* catalog."

"No one under 60 years of age will understand that remark," I replied.

"You mean you aren't watching the *Hee-haw* reruns on TV?" asked Pendergast.

"No," I admitted. "They are on at the same time as *Star Trek,* and I would rather watch Captain James T. Kirk and First Officer Spock of the *U.S.S. Enterprise."*

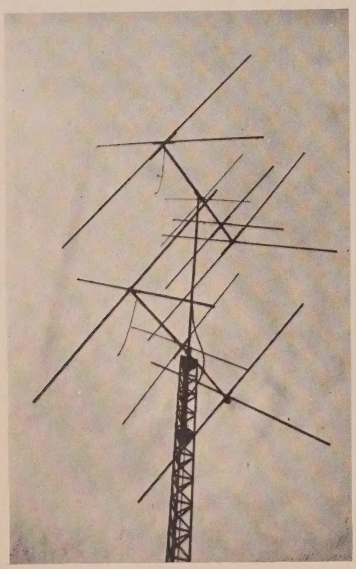


Fig. 1—The stacked Quad array of W6HFL. Two supporting booms are used, with a vertical separation of 22 feet. Each boom has two, large outer X-frames for the 20 and 10 meter loops. An additional center frame supports one element of the 2 element, 15 meter Quad. All three frames support a 3 element, 10 meter Quad. Driven elements are fed in-phase with separate transmission lines.

"Some time I wish you would explain subspace radio to me," commented my friend. "As for now, have you received any interesting communications about antennas this month?"

I waved at a pile of mail on the corner of the operating table. Pendergast dropped the copy of *CQ* and picked up a handful of envelopes.

"There are some very interesting letters," I admitted. "Just look at this note and photograph from Don, W6HFL. He has a stacked Quad array for 20, 15 and 10 meters that is quite unusual (fig. 1). This set-up consists of two supporting booms, separated 22 feet, one above the other. The spacing works out to be a half-wavelength on 15 meters, slightly less than a half-wavelength on 20 meters, and about ⅝-wavelength on 10 meters. Each boom has two, large outer X-frames and two smaller, inner X-frames. The upper, outer frames support a single 2 element, 20 meter Quad and all three frames support a 3 element, 10 meter Quad. In addition, the center frames and one outer frame support a 2 element, 15 meter Quad. The sketch of fig. 2 shows the general layout of the Quads."

Pendergast studied the photograph closely, then asked, "How does Don get the top set of Quad elements up in the air? With a helicopter?"

"He doesn't say," I admitted. "But after looking at the picture, my guess is that the vertical support pipe drops down into the tower. Don can then put the top Quad elements in place on the pipe, then push it up inside the tower until the elements are high enough in the air to mount the lower set of Quad elements. He uses separate feedlines for each band, and the upper and lower driven elements are parallel connected via two feedline sections of equal length. The system can be matched up in the same manner as the 144 MHz moonbounce antenna arrays described in last month's antenna column."

"That looks like powerful DX medicine," observed Pendergast as he studied the photograph as if it was a fine jewel. "Remind me to stay clear of Don in a pile-up." He relinquished the photograph as I picked up the next letter.

"Here's an interesting note from Bob, WB4DPG/5 in the Great State of Texas," I remarked, passing a drawing to my friend. "Bob put up a duplicate of the "sloper" antenna for 80 meters that was described by W6MZ in the September, 1975 *CQ* Antenna Column. Briefly, it is a quarter-wavelength of wire suspended at one end from a tower. In Bob's case, the wire is 62 feet long and the tower is 40 feet high. The antenna is fed at the top of the tower with a 50 ohm coax line and a 1-to-1 balun. The shield of the coax line is grounded to the metal tower at the top. That's about as simple an antenna as I know of for 80 meter work. The dimensions and the s.w.r. curve for Bob's sloper are shown in fig. 3.

"Bob says the amount of droop, or slack, in the wire and the tower height both affect the s.w.r. of the sloper to a marked degree. He "zeroed-in" on 3900 kHz by moving the bottom 10 feet of the antenna about, and finally ended up with it running parallel to the ground and about 7 feet in the air.

"As you can see, Bob's s.w.r. curve is considerably sharper than the one measured by W6MZ. But Bob's antenna is quite a bit lower, since his mast height is only 40 feet."

"The s.w.r. curve looks very nice over the phone band," observed Pendergast. "Obviously, the sloper is an effective antenna, even though it seems as if part of it is missing! Where is the other half of the an-

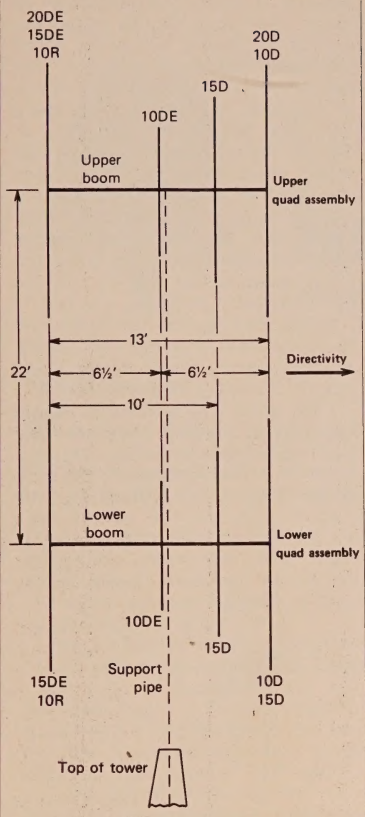


Fig. 2—Side view of W6HFL stacked Quad array. The assembly consists of 3 over 3 on 10 meters, with 6½' spacing between elements, 2 over 2 on 15 meters, with 10' spacing and a single 2 element Quad on 20 meters (mounted on the upper frame) with 13' spacing. Vertical separation is 22'.

tenna? Does the tower radiate? Bob's remarks about moving the s.w.r. curve about by adjusting the lower end of the antenna are interesting, too. That means the sloper can probably be adjusted to anybody's location and tower. The sloper deserves some more investigation, for sure, and I hope that some of your readers will work with it and send in their results and observations."

"Agreed," I said. "And for any material on the sloper, or other antenna that I use in this column, I'll be pleased to send the contributor one of my antenna handbooks."

Pendergast sketched the sloper in his notebook and then asked, "What else is new and interesting in the mail?'

"Well, I received a very interesting note from Allen, W2ISL. He had a 20 meter dipole in his attic and wanted to work 40 meters with it. His experiments produced a very novel 40 meter antenna from the dipole. He end-fed the wire, which was about 32 feet long, and worked it against ground, which was a vent pipe riser in the attic. This resulted in a rather high value of s.w.r. on 40 meters, so he placed a variable capacitor at the center of the wire—right at the point where the 20 meter coaxial cable used to be attached. He discovered that the reflected power could be dropped to near-zero by adjusting the capacitor (fig. 4).

"For 20 meter operation, the coaxial line is attached once again at the center of the antenna and the capacitor is set to minimum capacitance.

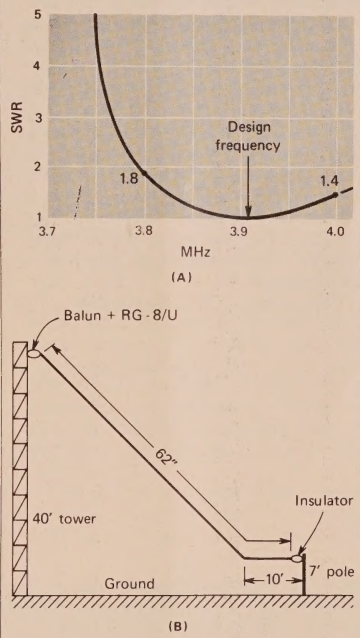


Fig. 3—The sloper antenna of WB4DPG/5. Sixty-two foot wire is hung from the top of a 40 foot tower. Bottom end of wire is about 7 feet above the ground, with last 10' of wire running parallel to the ground. Antenna is fed from the top end with a 1-to-1 balun and RG-8U feedline. Braid of coax is grounded to the tower at the top. S.w.r. curve shows good response between 3.8 and 4.0 MHz.

"This is another case, like the sloper, of guessing where the rest of the antenna could be. It seems as if the vent pipe riser enters the picture in some manner, and perhaps isn't a true ground. But that's only a guess. It proves, at least, that the last unusual, unorthodox antenna has not yet been invented."

"Interesting," commented Pendergast. "I guess the old story about using the bedsprings for an antenna could be true." He picked up the next letter from the pile.

"Well," he said with a smile, "Here's a super-simple antenna for 40 and 80 meters worked out by Tony, WA4JQS. Nothing magic, but this long wire works two bands with no tuning adjustments, and provides a better signal than separate dipoles for each band, which Tony used before. The antenna is a 2¾ wavelength wire for 40 meters, about 370 feet long (fig. 5). It's fed at one end directly by a 50 ohm coax line. On 80 meters, the wire is about 1⅜ wavelength long. Tony prunes the length for lowest s.w.r. on 80 meters, but finds the length not critical. The antenna runs north-northwest by south-southeast, and is fed at the southern end. Except off the ends of the long wire, this antenna out-performs single band dipoles erected at the same height as the long wire—by about 2 to 4 S-units—according to Tony. So, if you have a little space, this sounds like a fool-proof, simple and effective antenna to try."

"Yes, and you can probably series-tune it against ground as a long wire Marconi antenna for 160 meter operation," I replied.

I picked up the next letter and said, "This is a short note from my friend Van, W4YM, of *Skylane Products Company,* the Quad man. He has inclosed a short article from the great publication, *Florida Skip.* This is a fine little magazine. The article is by Hubert, K4QKF, and it describes a two-band Quad design for 20 and 15 meters that makes use of end loading and traps. K4QKF started out with a Quad loop that was slightly undersize for 15 meters (fig. 6). It is

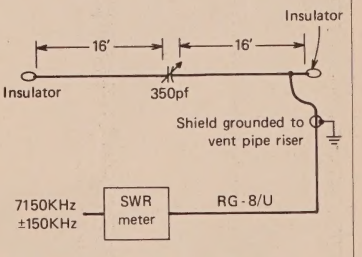


Fig. 4—The novel 40 meter indoor antenna of W2ISL made from a 20 meter dipole. The antenna is in the attic, about 35 feet above ground. The capacitor at the center of the antenna is adjusted for lowest s.w.r. at 7150 kHz and the antenna can be used over entire 40 meter band.

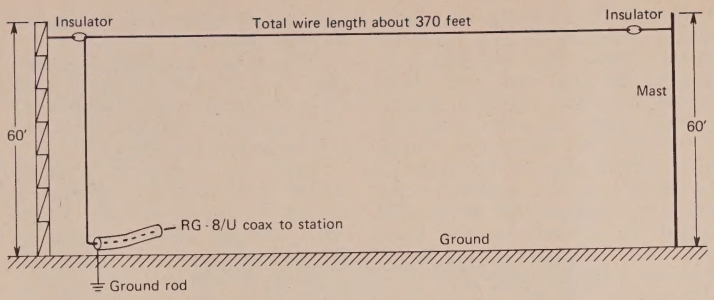


Fig. 5—A simple end-fed wire antenna for 40 and 80 meters used by WA4JQS. The wire is current fed at one end from a coaxial line and is 2¾ wavelengths long on 40 meters and 1⅜ wavelengths long on 80 meters. The shield of the coax line is grounded at the antenna end of line. The antenna length is pruned for lowest s.w.r. on 80 meters. The vertical section of the antenna is held about 20 feet away from the tower.

about 11'5" on a side of the driven element. He loaded it to resonance at 21.2 MHz by the addition of short stub wires placed at the high voltage points of the loop. These stubs are marked (A) in the drawing.

"In order to set the exact length of the stubs, he coupled a dip-meter to the feedpoint at the bottom of the loop with a 1-turn coil mounted on a coaxial fitting.

"Once he established resonance, he then added a tuned trap and an extension to the stubs on each side of the loop to achieve resonance at 20 meters. This is the same principle used in a tri-band Yagi. Data on the traps is given in the drawing. Each trap was dipped to 21.3 MHz before installation in the antenna."

"Well, what did K4QKF use for the capacitors?" inquired my friend, studying the drawing.

"According to the *Florida Skip* article, they were moulded mica capacitors," I replied. "That sounds OK if you are just using an exciter, but I doubt if they would stand up to high power. I'd suggest that you use 50 pf, 5 kv ceramic capacitors, such as the *850-series* made by *Centralab.* They'll handle the legal power limit with ease."

"In addition, if I were building the antenna, I would resonate the 15 meter traps to a slightly lower frequency to provide somewhat better bandwidth response. I would tune the traps to 21.0 MHz, or even as low as 20.9 MHz. In this way, the antenna can cover the low frequency end of the 15 meter band, as well as the phone band. Experience has shown that it is best to tune the traps to the lowest frequency of operation in the band, and most antenna designs using parallel-tuned traps have the traps tuned to the low end of the band, or just outside the low end."

"How does he tune the Quad loop to 20 meters?" inquired Pendergast, making a quick sketch of the Quad loop in his ever-present notebook.

"The same way a tri-band Yagi is tuned to 20 meters," I replied. "K4QKF added extension tips after the traps and trimmed them until the whole assembly resonated at 14.2 MHz. The tips run inward along the horizontal support, and space is somewhat limited. So a small loading coil was added at the middle of the extension tip, and the outer tip (B, in the drawing) trimmed for resonance, using the grid-dip meter. The little loading coils (L_1) are wound with 26 turns of insulated wire on a ½-inch diameter ceramic insulator. The length of the winding is about 2½ inches."

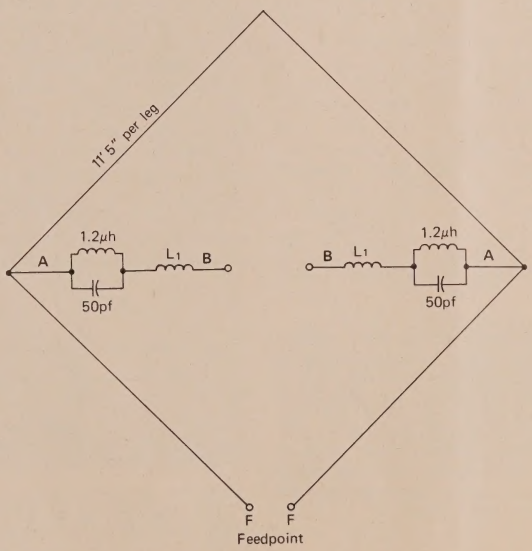


Fig. 6—The K4QKF two band Quad element for 15 and 20 meters. The under-sized element is resonated to 15 meters by the addition of the short "A" sections. Parallel tuned traps isolate the tip sections "B" which resonate the element to 20 meters. The 20 meter extensions are loaded with coils L_1 to conserve space. The trap coil is 1.2 microhenries (12 turns, ¾-inch diameter, 1½-inches long). See text for adjustment. Parasitic element sides are 5% shorter for director and 5% longer for reflector. Traps and end sections are adjusted for proper resonance.

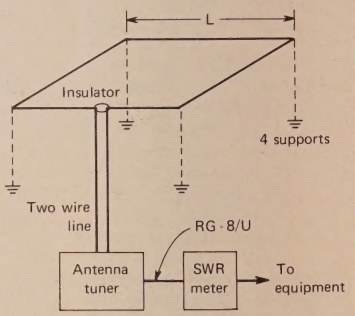
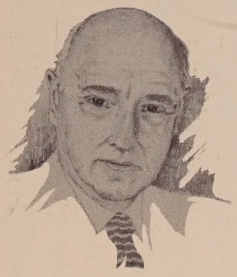


Fig. 7—"Lazy Quad" is popular antenna for high frequency bands. Side L is a quarter wavelength at lowest operating frequency. Antenna is fed with tuner and two-wire line. TV "ribbon" line can be used for power levels less than 250 watts.

"Very good," remarked Pendergast. "That produces an element that resonates on both 15 and 20 meters and uses only one feedline. Now, what about the Quad director?"

"You can use normal spacing between the elements. The total length of wire in the parasitic element is

(continued on page 78)



In Focus

BY BILL DEWITT, W2DD

VNBTV Anyone?

Bob Stone, W3EFG, of Exton, Pa., *The* primemover in G.E.'s Sampledot TV System made a potent presentation on VNBTV (Very Narrow Band TV) at the A.R.R.L. New England Division Convention in Hartford last November. Remember that name, SAMPLEDOT, because I have a feeling you're going to be hearing more about it as time goes on!

The Sampledot system is a means of transmitting and receiving video information (including motion) with less than standard TV bandwidth requirements. The design of the system can be varied according to application requirements with attendant changes in bandwidth and resolution. Scan conversion is used at the camera input and monitor display stages to provide compatibility with broadcast TV equipment. The name Sampledot is apparently derived from the pseudorandom sampling of the raw video input utilized to effect the desired bandwidth reduction. The comparison of Sampledot and standard TV images shown in Fig. 1 shows that the quality of Sampledot images is indeed excellent.

VNBTV as outlined in Bob's paper is an application of the Sampledot system for possible use in the amateur v.h.f./u.h.f. spectrum starting at say, 29 MHz. It would provide good quality, real-time TV motion that is life-like. Resolution would be equal to or better than present SSTV standards. R.f. bandwidth would be 15 to 20 kHz. Sounds exciting, doesn't it?

VNBTV Time Goals and Objectives

Bob kindly supplied me with a draft of his A.R.R.L.-presented paper. His time goals call for completing initial lab experiments by early 1976; conducting r.f. link tests by mid 1976; reporting results to the F.C.C. and A.R.R.L. *et al* by late 1976; firming up standards and petitioning F.C.C. for rules by 1977; developing system hardware for amateur use — post 1977.

I think that congratulations are in order for not only Bob's innovative thinking—but also for the fact that he has evolved a coherent and well articulated plan for developmental progress.

Looking Ahead, Experimentation Frequencies Needed

Present day occupancy of our v.h.f. and u.h.f. frequencies leaves broad frequency ranges open to attack for non-amateur proposals. Surely there is room for valid and useful experimentation at the high ends of our 29 MHz. and 50 MHz. bands as well as segments of the 144 MHz., 220 MHz. and higher frequency bands. Purposeful use of these frequencies could help to ensure their continued assignment to amateurs.

Looking ahead, let's hope that Bob gets loads of support for his program from both the A.R.R.L. and the F.C.C. The expanded communications capabilities offered by this project warrant on-the-air testing for practical operating experience at the earliest possible date.

SPETMFMSSTV!

No, I'm not missing a diode in my keyboard! That abbreviation repre-

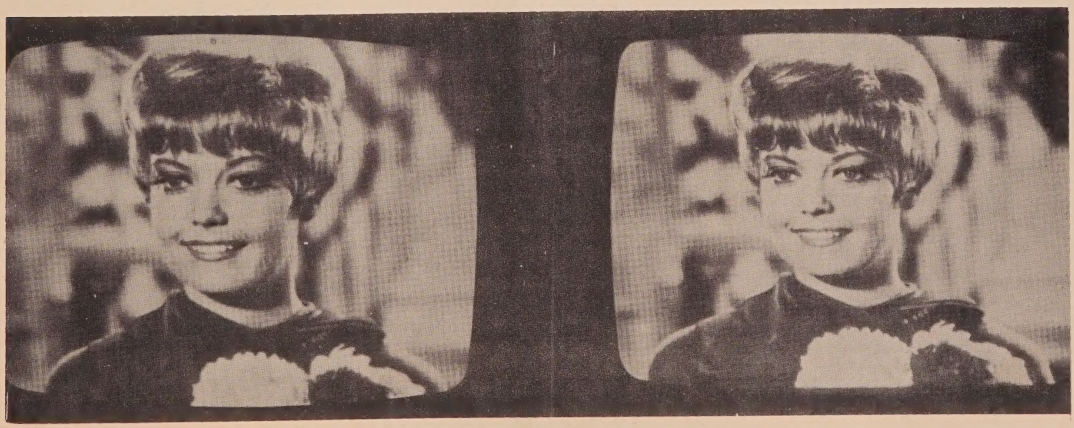


Fig. 1—Comparison of Sample dot and Standard TV Images. (Sample dot on the left.)

Fig. 2—Original Kodacolor Passport Picture of Mrs. W2DD.

sents what I think is a growing group at home and abroad—the Society for the Preservation and Encouragement of Two Meter FM SSTV. From London to Miami and other assorted spots all over the globe come reports of evening nets of SSTV on 2 meter f.m. The closed circuit quality pictures entice many a slow scanner away from the zilch on 20 and multipath of 75!

My latest communique on this subject comes from Captain Tom Smith, WB4IFU of Miami. At this writing there are 15 SSTV stations in nightly contacts. They range from Ft. Lauderdale southwards. Net operation is on 147.57 Simplex on Wednesday and Friday nights.

Tom reports that Al Gonzales, WB4PWR, of Miami, is putting up a repeater operation which will likely be operational by the time you read this column. Frequencies will be, 147.81 In, 147.21 Out. Sounds like a lot of fun!

If you have a local slow scan group operating on 2 meter f.m., please drop me a line and a picture or two. Incidentally, with repeaters coming up like dandelions (but a lot more welcome!) it's a good idea to check with your local Repeater Council group before settling down on a randomly chosen frequency.

Fig. 3—Enlarged image of Kodacolor original obtained with Cosmicar Marco lens.

Do You Have A Home in Your Snapshots?

Snapshots of your family and your home represent an excellent source of pictures to transmit via SSTV. Your wife, kids, and pets are of interest to your slow scan friends. In addition, amateurs everywhere are interested in what your home looks like. A Yagi beam at 20 meters off the ground tends to look pretty much the same whether it's above New York or New Guinea soil, but the construction of homes varies enormously around the globe! If you have a photo of your home available, why not show it to your friends on another continent?

How To Make Big Images Out of Little Pictures

Having viewed several million snapshots during my years in Kodak's color processing operation, I can state flatly that the *One Thing* that most amateur photographers could do to improve the quality of their pictures (and with the least effort) would be to get CLOSER to their subjects.

If you look at the photographs used in virtually any sales catalog or magazine advertisement today, you will quickly see that the image sizes are BIG, not small. This is so that you can see and understand as much as possible about the product. What has all this to do with SSTV? The restrictions on detail imposed by our 128 line slow scan system call for the same treatment—BIG images. How do we get these big images?

The first thing to do is to use common sense in your choice of subjects. Don't expect to get good results with one-eighth inch high images in a snapshot. However, if you have a nice sharp photo of your wife —and let's say the image of her head is about one inch high, you can fill your SSTV screen with that image without becoming an optics wizard.

An example of what I'm talking about is shown in the photo sequence showing a picture I took for use on my wife's passport. Fig. 2 is the original Kodacolor snapshot with a 1¼ inch square marked off around La Belle Peggy's head. The advantage of having a lens that will let you get close to the subject may be clearly seen in fig. 3 which shows how the 1¼ square can be made to nearly fill the screen by using a Cosmicar Macro 25mm. focal length, f1.4 lens on a Robot Model 80 camera.

Fig. 4—Extension Tube Set for use with TV lenses. (The lenses shown are not part of the Set.)

If you don't happen to own a Macro type lens, there are two other approaches to larger images. Most photo stores sell closeup attachments. Ask for one suitable for use with a 16mm. movie camera lens. More effective, and more expensive are Extension Tube Sets. Denson Electronics in Rockville, Conn. sells a Cosmicar Extension Tube set No. EX-C6 which can be used to great advantage with the lenses frequently used in TV work. The extension tube /ring is used as a spacer to increase the distance between the back of the lens and the vidicon target with an attendant increase in image size. You can see what extension tubes look like in fig. 4. I included some lenses in the picture just for size comparison, they're NOT part of the set!

If you're on a tight budget, just cut some washer-like spacers out of a piece of cardboard, slip them between the lens and the mount surface and voila—suddenly you have BIG images on your screen. Don't overdo on the thickness, and be careful not to get paper dust on the vidicon or the lens.

Fig. 5—Program Board designed and built by Jerry Foster, WØQWH.

What About 256 Line Frames?

Does the advent of 256 line frames wipe out our concerns about image size? Well not entirely—why not take advantage of all possibilities and transmit the sharpest pictures possible with the system available to you? The higher resolution of 256 line pictures brings us a step closer to broadcast television quality so why not take a page from the commercial boys and still go for the BIG images? Take an objective look at just about any TV channel for a few minutes — and how many "long shots" do you see? Documentaries and Travelogues may include quite a few "long shots", but apart from setting a scene, News and Entertainment features operate at a rather close range. I'll have more on 128 versus 256 line resolution in a future column.

Incidentally, it's hard to do justice to the subject of lenses and image size in a monthly column, so if you have any questions regarding this subject, please drop me a line. (A new book on slow scan that Cop MacDonald and I are co-authoring will include a chapter with illustrations and charts related to lenses, image sizes, etc.)

Feedback Can Be A Good Thing!

Back in October we published information supplied by Hal Godfrey, W6EYY, of San Carlos, CA. on how to set up a "program board" for making slow scan tapes. Jerry Foster, WØQWH, of Stanley, Kansas has a good working system too. As you can see in fig. 5, Jerry has his camera mounted horizontally, facing a sliding board. For graphics, he uses stick-on letters. Shirt cardboards cut to 6×8 inches carry his sketches and messages. (Just in case the term "shirt cardboards" is an unfamilar one to some of our readers, let me explain that this is a piece of cardboard inserted in a shirt by commercial laundries and some shirt manufacturers!)

Back to Jerry's sliding board. By having two slots for cards, he can change one card while the other is being recorded, pretty neat! Jerry found a small light control made by Ohmite (Model No. PCA-1000) that does a fine job of controlling his lamp brightness.

To facilitate smooth programming, Jerry has modified an eight track cartridge tape player so that he can start and stop it at will with holding relays. He standardizes his tape lengths and adds a piece of foil to actuate the cut off. He puts four programs on each cartridge and can

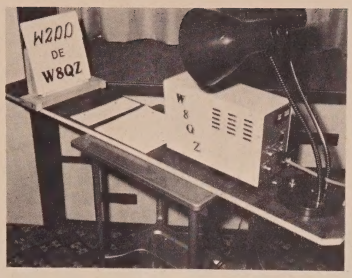


Fig. 6—Program Board designed and built by "PT" Taylor, W8QZ.

quickly select the program he wants with the Selector control. When I see what Jerry has done to get things organized, I just cringe as I contemplate my poorly labeled, messy stack of cassettes!

To wind up the program board story, fig. 6 shows how "PT" Taylor, W8QZ, of Springfield, OH. has solved the problem of varying size/distance requirements. The simple easel holds any size card up to 10 inches square. Edge guides on the base of the easel slide along the board carrying the whole assembly so that there is ample adjustment capability for most any size subject.

"PT" does a fine job of photographing received pictures with an equally simple but effective camera jig or holder as seen in fig. 7. "PT" made up the holder so that it fits the pyramidal-Polaroid form well enough to prevent the camera from slipping. He uses a Polaroid close-up attachment No. 543 on an old No. 103 camera. Sorry space will not permit including one of "PT's" off-the-screen photos.

Canadian Capers

John VandenBerg, VE3DVV, of Mt. Hope, Ont. comes up with another trick or two every week! A few weeks ago John had his slow scan "audience" puzzled with upside down keyboard graphics and a few other "goodies". His latest trick of the

Fig. 7—W8QZ's station, showing homebrew camera mount used in photographing SSTV monitor screen.

week involves more sophisticated hijinks.

Using what might be called a light-pen technique in connection with his slow to fast scan converter, John has been deleting letters, adding words, and/or crossing out parts of received frames before playing them back out of the scan converter memory for the amazement of their originators. Imagine the consternation of W.A. Hendry, VE3BNW, of Welland, Ont. when John played back one of VE3BNW's keyboard frames with all the "h's" and "a's" removed!

The technique involves sliding a small photo-cell probe across the monitor CRT trace, amplifying its output signal, converting it to a digital form, and then storing it (as a black or white) in a memory that is line-synced with the received image. On playback, the black or white line so generated comes out of the mem-

Fig. 8—W2DD station ID modified by VE3DVV's light pen.

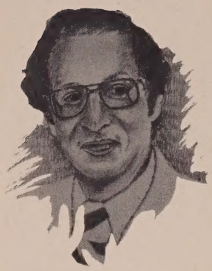
ory in sync with the rest of the picture creating an X or other mark in accordance with the light pen path. Fig. 8 shows what John did to my W2DD station ID. A talented artist like Ko Sasaki, JA7FS, could really have a ball with this little gem!

Seems to me that Doctor Suding, WØLMD, published something on this technique sometime ago. Maybe we don't need keyboards — just "write" on the tube!

Brute Force Scan Conversion—Another VE Caper

Clayt Anguish, VE3LU, of Brantford, Ont. monitors the Sunday morning VE SLOW Scan net on his 439.25 MHz. FAST scan monitor. Yep, it's the ubitquitous VE3DVV at work again! John points his fast scan camera at his (scan converted) SSTV monitor and pumps the net video

(continued on page 72)



Math's Notes

BY IRWIN MATH, WA2NDM

In doing our annual end-of-the-year cleanup we came across several ideas pertaining to projects we had built some time ago and, after reminiscing a bit, decided to pass the most interesting ones on to you this month.

Item #1 is a gadget we have had in our lab/workshop for at least 10 years now. It is indispensable when the occasion arises to trace an electrical or mechanical drawing from a book or magazine. This device is also great for checking P/C artwork or even photographic negatives.

What we are talking about is the "copy box" shown in exploded view in figure 1.

This box will allow rapid tracing of drawings using almost any type of translucent paper (including bond) because of the back lighting feature it has. It consists simply of an enclosure containing two small 15 or 25 watt incandescent lamps (or fluorescent lamps if you prefer) connected in parallel, across the 115 volt a.c. line, a translucent writing surface, and an optional power switch. Light passes up through the drawing and through the paper making tracing or P/C board examination quite easy. This device can also be used for photographic processes in a manner similar to a print box if one so desires.

All construction details are clearly shown in fig. 1 as are the dimensions we used. You can of course vary these to suit your needs.

For even easier construction, an inverted aluminum radio chassis or something along that line could be used instead of the wooden box. The additional purchase of a draftsman's mechanical drawing set will greatly enhance the usefulness of the copy box. If you do use a metal box be certain you take care to prevent any potential a.c. contact with the metal.

Our second offering is a u.h.f. field strength meter that has "saved the day" on at least a dozen occasions. It is useful on 6 meters, 2 meters, 1¼ meters and aside from determining whether or not a transmitter is putting out power within its frequency range (50-500 MHz). The meter is sensitive enough to detect power in the multiplier stages of a transmitter if close enough coupling is provided. Provision is also made to check on modulation of a received signal.

The r.f. is picked up by the antenna and tuned circuit L_1 C_1. D_1 rectifies this r.f. and the two fixed capacitors in conjunction with the r.f. choke filter the rectified signal. The resulting d.c. signal is applied to M_1 a 0-50 micro ampere meter. J_1 is included so that a set of earphones can be plugged in and used to check on modulation quality of a received signal. The field strength meter is built in a standard 6x5x4 minibox or similar sized enclosure. L_1 is a 1½" length of #14 wire which is bent around a circular surface so that its ends come into contact when the terminals of C_1 which is a Lafayette 99F62176 variable capacitor. The antenna is a common telescoping whip soldered to a PL-259 coaxial connector. This connector mates with an SO-239 mounted on the case and

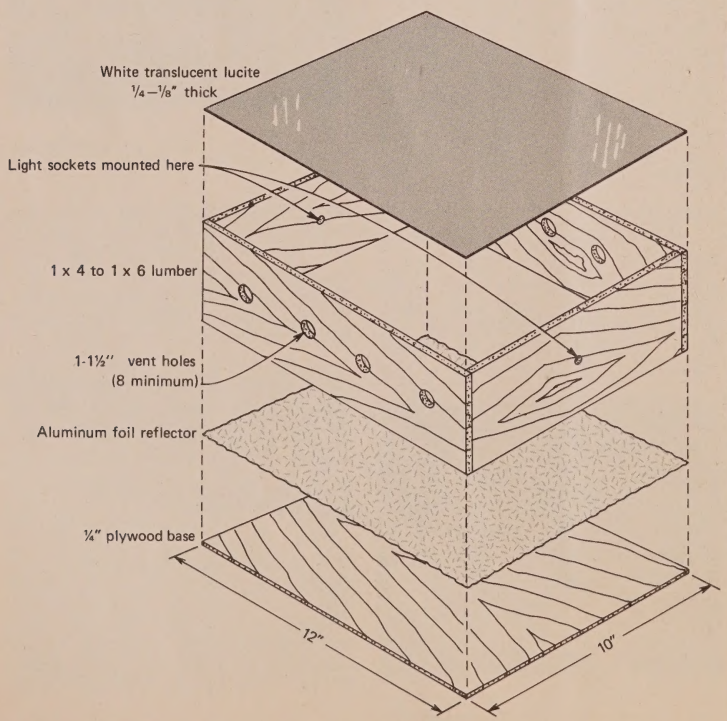


Fig. 1—An exploded view of the copy box discussed in the text.

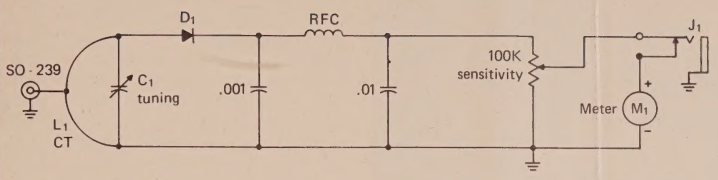


Fig. 2—A v.h.f. field strength meter. Consult the text for details. The frequency range can be varied somewhat by adjusting L_1.

thus allows other r.f. sensing heads to be easily connected. For D_1 any general purpose Germanium diode such as a IN34A can be used. I used a 1N21 surplus diode because it was designed for high frequency work and happened to be available, however the 1N34A will work in this circuit. Be sure to connect D_1 as close as possible to C_1. The r.f. choke is made by winding 25 turns of #28 or #30 enameled or formvar wire on a 1 watt resistor of 2.2 megohms or more. When wiring the earphone jack be sure to use the correct lugs or the jack will not work properly. The entire circuit was wired on a small piece of copper circuit board which was then mounted to the front panel by 4 screws and 1" spacers. When wiring the unit, be sure to observe correct polarity on the diode. The schematic diagram is shown in fig. 2.

The field strength meter is calibrated using a good quality signal generator which is coupled to the antenna by wrapping 3-4 turns of wire around it with no actual connection. Readings taken on a 0-100 dial attached to C_1 as the frequency is varied, are plotted on a graph which then becomes the calibration chart for the meter.

In addition to this meter, the two devices shown in fig. 3 will also prove to be very useful.

The first of these is a #47 pilot lamp soldered to a 1 turn loop of #20 insulated buss wire. This lamp is used by pushing its coil in between the turns of air wound coils in transmitters to check power levels. It performs nicely from about 10 MHz all the way up to 90-100 MHz and is ideal for checking resonances in multiplier stages of u.h.f. transmitters.

In a similar manner, the 60 watt lamp and its "buss wire additions" can be "plugged" into a u.h.f. connector to serve as a dummy load. Power levels can be roughly estimated by the brilliance of the lamp although the efficiency suffers at higher frequencies. For a preliminary load however, the lamp works fine.

The final item, I am passing along for what it is worth—maybe only nostalgia.

While going through my supply of components, I came across a small collection of old, surplus transmitting tubes of various sizes and shapes. Before junking them however, I decided to reminisce a little, and pulled an old tube manual off the shelf. I was at once surprised to notice the ratings of these "bottles" and after consulting the local surplus dealers catalog, even more surprised at the *very* reasonable prices for these tubes. (Since no one really wants them). Referring back to the tube manual I checked to see if these tubes were really good for something, even today. The collection of data in the chart of fig. 4 is the result. In all cases, the vital information is given. I have only chosen 4 of the dozen or so old tubes that I have so as to not burden the reader. If this sort of thing interests you however, other good sources of additional information are: *The Radio Amateur Handbook*, 1940 to 1945 editions, and old copies of the *RCA Transmitting Tube Manual*. Any ham, 40 years of age or more, will probably prove a valuable source of information also! Prices quoted are from one surplus dealer in New York City and by careful shopping and scrounging, can easily be equalled or in most cases bettered.

While I am not suggesting that you run out and buy these—if you do have them around, you might be able to put them to use and bring back memories of days gone by.

See you next month

73, Irv, WA2NDM

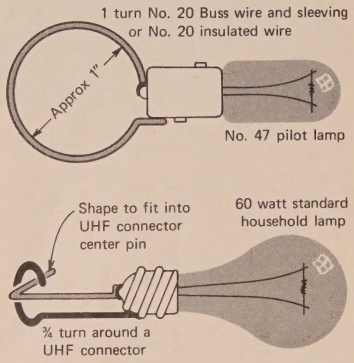


Fig. 3—Two simple r.f. accessories. Uses for these aids are discussed in the text.

Spread The Word

An eye-catching bumper sticker encouraging the man in the street to "Talk to the World—Become A Ham Operator" is available from *CQ* for 25¢ plus a legal-size s.a.s.e. Quantity prices upon request. Write to: *CQ*, 14 Vanderventer Av., Port Washington, NY 11050.

Tube type	Drive power, watts	Maximum RF output, watts	Maximum frequency, MHz	R_g value	E_h value	B+ value, volts	Plate current, ma	Cost
806	34.0	780	30	24.0K 25 w.	5.0 v. @ 10.0 a.	3000	330	$ 9.00
808	9.5	140	30	6.7K 10 w.	7.5 v. @ 4.0 a.	1500	125	.90
810	12.0	475	30	4.0K 20 w.	10.0 v. @ 4.5 a.	2250	275	12.00
812	6.5	170	60	7.0K 10 w.	6.3 v. @ 4.0 a.	1500	150	3.50

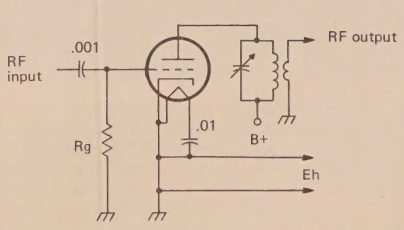


Fig. 4—A typical r.f. amplifier circuit employing the "antiques" described in the text. With regard to the chart above, tubes with 30 MHz maximum ratings can be used at 60MHz with a 75% reduction in power ratings. All ratings are c.w. ratings. As to what they will do in linear service, your guess is as good as mine.

Novice

BY HERBERT S. BRIER, W9EGQ

Many amateur radio clubs and independent groups across the country sponsor Amateur study courses to aid all comers to earn their Novice licenses and the new Communicator license when it is finally authorized. The course usually comprise about 10 weekly lessons, and the prospective students are virtually promised that if they attend all classes and do a minimum amount of studying between lessons, they will pass the Federal Communications Commission examination easily, even if they do not have any previous electronic knowledge. Furthermore, the majority of students who do both, pass their Novice examinations. At that point, the courses end, leaving the new Novices to his own resources.

Many readers of the Novice Shack got their start in amateur radio in earlier courses of this type. Unfortunately, too many recent graduates disappear from the scene in a short time, often without getting on the air. Why?

Our theory is that the very success of the classes in teaching their students enough code and theory to pass the Novice examination so easily is a major part of the problem. The graduates whose only knowledge of Amateur Radio is what he learned in the course, have only the foggiest notions of how to tune a communications receiver or adjust a transmitter for best results. He probably does not know how to call or answer a "CQ." The only code that he has copied is probably the instructor's sending in class and from recorded code courses. Consequently, he finds that copying code signals that are fading in and out of interference and noise on the air and simultaneously manipulating the receiver controls is playing in a much tougher league.

Faced with these problems, that often seem overwhelming to a new amateur, and no one to ask for help, it is understandable that some of them settle for an 11-meter box which is simpler to operate than a broadcast radio receiver or a tape recorder, and which brings him all the advice that he can use. Of course, we know that amateur radio offers more rewards than any other electronic hobby, once you find the key. Unfortunately, they have trouble finding it. Also, not all of these "deserters" intend to give up amateur radio forever. Some of them enrolled in the Novice courses in the first place only because they were told that having a Novice license when the new codeless v.h.f. amateur phone license comes into effect will automatically make them eligible for the new privileges. And they may still be right!

J. Christopher Fagas, WN2VVV, 8 Burdick Rd., Pearl River, N.Y. 10965, uses a Galaxy V, Mark II transceiver and matching v.f.o. His antenna farm in the attic comprises 15 and 40-meter dipoles and an 80-meter "long wire" consisting of three "Slinkies" in series fed through an antenna matcher. He gets out well on all bands. Chris is president of his high school radio club, and a member of MARS and Civil Defense. We are sending WN2VVV a 1-year subscription to CQ for this winning entry in the Monthly Novice Shack Photo Contest. If you want to enter the contest, send a sharp photograph (preferably black and white) of you at the controls of your amateur station and some details of your radio career to: Novice Shack Photo Contest, c/o Herbert S. Brier, W9EGQ, 409 S. 14th St., Chesterton, Ind. 46304. Suitable non-winners will also be published as space permits.

Improving Elementary Amateur Courses

A simple modification of beginning amateur courses could go a long way in helping their graduates to get on the air. Instead of ending the courses with the administration of the Novice examinations, extend them for a few weeks. The added sessions should be devoted to giving the students practical experience in tuning and operating amateur equipment (using dummy antennas on the transmitters).

Show them how to change bands in a minimum of time, how to "zero beat" a v.f.o. to a frequency on their receiver dials. Give them experience copying code through interference—easy to do with a tape recorder. Set up an operating station in the classroom, letting those whose licenses have already come make contacts while the rest of the class kibitzes. Start a Technician/General class course as soon as the Novice class ends.

W1AW Code-Practice Transmissions

Anyone who has a receiver capable of tuning one or more of the amateur bands between 1.8 and 148 MHz can get excellent code practice from the daily code-practice transmissions from W1AW, the station of the American Radio Relay League, Inc., Newington, Connecticut, on the following schedule:

Day	Time[1]	Speed, w.p.m.
Mon., Wed., Fri.	9:00 a.m.	5, 7½, 10, 13
Mon. thru Fri.	4:00 p.m.	10, 13, 15
Daily	7:30 p.m.	20, 25
Sun., Tues., Thur., Sat.	9:30 p.m.	35, 30, 25, 20, 15
Mon., Wed., Fri.	9:30 p.m.	
Tues., Thur.	9:00 a.m.	

[1]Eastern Time. Subtract one hour for Central time, two hours for Mountain time, and three hours for Pacific time.

Frequencies: approximately 1.805, 3.58, 7.08, 14.08, 21.08, 28.08, 50.08, and 146.588 MHz. W1AW also sends amateur news bulletins at 10 w.p.m. at 0000 Eastern time. Monday through Fridays: and at 18 w.p.m. at 12:00 and 8:30 p.m., Eastern time, on the same frequencies.

FCC And Related News

Primarily because of the continued deluge of CB license applications flooding the FCC Amateur and Citizen's Radio Bureau, the target date for the release of the new VHF Amateur phone license keeps being postponed. Spring is the date being mentioned now, possibly more as a hope than a promise.

In an effort to cut down the long delays in the licensing process, the FCC is trying to streamline operations. Soon (as the government measures time), when a licensee upgrades his license class—say from Novice or Technical to General—his old license will probably be modified on the spot, instead of being done in Washington weeks later. Simplified application forms are on the way, and lifetime operator licenses for all amateur classes, except Novice and Communicator, with renewable station licenses—the system used in a number of foreign countries — are also being considered.

Because some amateurs have been trying to upgrade their own licenses without the formality of passing another test when renewing their licenses, the original license (not a photocopy) will soon have to accompany the renewal application.

Overseas, Australia and Holland instituted Novice type licenses in their countries in 1975. Holland earlier had cancelled its CB service because of flagrant illegal operations and confiscated many illegally-operated units. On a happier note, West Germany now issues amateur licenses to 16 and "mature" 14-year applicants.

Hans Tischer, WP4EBQ, P.O. Box 524, San Juan, Puerto Rico 00902, operating his Yaesu FT-101B transceiver and associated equipment.

News And Views

Short short story from *Short Skip,* club paper of the Lake County, Indiana, Amateur Radio Club, "For sale. CB transceiver. Looking for Swan 350 with power supply. Mike, WB9PIR." (ex-WN9PIR)

Art Geyer, K8SWW, WØJSW, ZF1-AG, 860 S. Main St., Milford, Mich. 48042, comments on Jon, WNØMNK's remarks in the October, 1975, Novice Shack about General class operators working in the Novice bands as an Extra class licensee who has worked over 6518 Novices! Art uses a Yaesu FT-101E transmitter with a FL-2000, 1-kw amplifier when it is needed. "Ninety per cent of my Novice QSO's are in answer to Novice CQ's using the FT-101E. The only time that I push up the power is, when in the middle of a contact, some other Novice starts to call CQ on top of us. Of course, if he had listened on the frequency before calling CQ, I would not have had to kick up the power. By working Novices, I try to help them along and teach them things I have learned in years of operating. Of my 6518 Novice contacts, a few thousand have been at speeds of three and four w.p.m. I wonder if WNØMNK takes the time to work the slower Novices at these speeds now that he has a year of experience under his belt.

"The reason that I take time to work Novices is to repay Dr. Ben Bragg, W8YDK, now a silent key, for the many hours he spent with KN8-

(continued on page 72)

NEW from NRI **Home training in AMATEUR RADIO**

NRI, leader in Communications, Television, Electronics and TV-Radio home training, now offers the first in Amateur Radio courses, designed to prepare you for the FCC Amateur License you want or need.

Don't lose your favorite frequency

The FCC has said "either-or" on licensing, but to pass Advanced and Extra Class exams, you need the technical guidance as offered by NRI. NRI Advanced Amateur Radio is for the ham who already has a General, Conditional or Tech Class ticket. Basic Amateur Radio is for the beginner and includes transmitter, 3-band receiver, code practice equipment. Three training plans offered. Get all the facts. Mail coupon. No obligation. No salesman will call on you. NATIONAL RADIO INSTITUTE, Washington, D.C. 20016.

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JOHN A. ATTAWAY, K4IIF, ON

DX

Amateur radio DXing is still the world's number one hobby. If your faith ever weakens all you need do is take a trip to DX-land to have it completely restored. Your humble DX Editor recently returned from a visit to England, Switzerland, Denmark, Norway and Iceland, all countries in which Florida sells orange juice by golly, and can state first hand that the sincere enthusiasm over the visit of a fellow practitioner of the radio arts is unmatched in any other hobby with which we have experience.

Upon our arrival in Leeds, England, without sleep and thanks to the air transport industry also without luggage, the cheerful face of Syd Sefton, G3ZBA, looked awfully good. Syd furnished not only bed and breakfast, but pajamas and razor as well. He had also made the necessary arrangements with the Radio Regulatory Division of the Home Office for K4IIF to operate G3ZBA during the dates of the visit. This is the preferred procedure in England when only a short visit is planned.

However, if you're contemplating an extended trip to the U.K. you can apply for your own call under the Reciprocal Operating Agreement. Licenses are now handled by the Home Office instead of Post and Telegraph. The address to contact is: Home Office, Radio Regulatory Division, Waterloo Bridge House, Waterloo Road, London SE1 8VA, England. For a trip of over 3 months, a Type C license may be obtained which is good for 1 year providing the applicant has evidence of authority to remain in the British Isles for that period of time. If your visit is for 3 months or less, a type D license is available. Visitors receive G5 calls for use within England, but if you travel to Scotland, Wales, Northern Ireland, the Channel Islands or the Isle of Man, you may use the same suffix with the appropriate GM5, GW5, GI5, GC5 or GD5 prefix.

Syd, G3ZBA, had also invited Dr. John Allaway, G3FKM, DX Editor of *Radio Communication, CQ* DX Awards Checkpoint for the U.K. and now President of the Radio Society of Great Britain, for a visit. A party was arranged for the 2 DX Editors which included some 15 amateurs from the local White Rose Amateur Radio Society. This was a noteworthy landmark for the 2 DX Editors who had corresponded for many years but had never met.

From England it was off to Geneva and the multi-faceted pleasures of that beautiful city on an October weekend. By the sheerest of coincidences it was the *CQ* Worldwide Phone Contest weekend and the 4U1ITU station was available. Not even the stress of a one a.m. arrival, with all the luggage lost for a second time, could dampen one's enthusiasm on finding the rig all tuned up and a night's supply of coffee and rolls courtesy of Renato Brossa, Station Manager for 4U1ITU, and Ted Robinson, F8RU, Secretary of the International Amateur Radio Club.

Operation from central Europe during the contest was a big change

The CQ DX Award Program

SSB	C.W.
414...DK9KD	188...W5LUJ
415...WA6GFH	
416...WB6RMG	

Endorsements

W6GBY...150

Complete rules and application forms for the *CQ* DX Award Program may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX/WPX Awards, Box 3388, San Rafael, Calif. 94902

The Icelandic Radio Amateur Society (I.R.A.) meets for dinner with K4IIF at the home of John Einarsson, TF3AC. Standing left to right are John, TF3AC; Oli, TF3AW; Kiddi, TF3KD; Doddi, TF3SB; Axel, TF3AX; and Kris, TF3KB, President of I.R.A. Seated is DX Editor John, K4IIF. Club Secretary, Steve, TF3SE, left early and missed this photo taken by the XYL of TF3AC.

The WAZ Program

S.S.B. WAZ

1292...JH3DAE
1293...DK9FB
1294...ZS2DC
1295...YU1QCQ

C.W.-Phone WAZ

3893...YU1SJ
3894...W9JNB
3895...K3AMI
3896...WA5WEY
3897...WA2JVB
3898...DK2AD
3899...ZS6KT

Single Band WAZ

20-Meter Phone

15...CT1RM
16...JH1JGX
17...I3LLD

Complete rules for the Single Band WAZ Program appear on pgs. 57-58 of the December, 1972 issue of *CQ*. Complete rules for regular WAZ are found beginning on pg. 46 of the April, 1975 issue. Application blanks and reprints of the rules for all WAZ awards may be obtained by sending a self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

During the CQ Worldwide DX Contest, K4IIF operates through some gentle ribbing by Ted Robinson, F8RU, Secretary of the International Amateur Radio Club, and Osmo Koskenniemi, OH2KH, visiting operator and photographer. (Photo by OH2KH)

from previous stands in the Caribbean. The rare Soviet Asian republics were ducksoup and we never knew there were so many Russian club stations. With Osmo, OH2KH, as second operator we made a few over 1000 contacts. It will be fun to try again on some future visit and push for a good score. When the European stations come in all day, but only count 1 point each, it requires an entirely different strategy.

After a hectic week selling Florida orange juice, always in great demand in Europe, we arrived in Copenhagen where we were met on Saturday night by Leif Ottosen, OZ1-LO, Poul Nielsen, OZ3PO, and Heinrich Thomsen, OZ7HT, who had arranged a dinner of wild duck and seafood and an evening of fellowship as only the Danes know it. Naturally it peaked at the OZ3PO hamshack for a turn at the rig. Even 20 meters cooperated by being open to Florida. Our special thanks to Blake Ades, WB4AEY, who listened for us with news of Winter Haven throughout all our stops.

Next on the itinerary was Oslo, where dinner and festivities had been arranged by Hans, LA4YF, Awards Manager of N.R.R.L., who is now operating the *CQ* Awards checkpoint in Norway from his home in Telemark. Hans is also QSL Manager for the Norwegian end of the Morokulien station, LG5LG. N.R.R.L. Traffic Manager, Ken, LA6XI, and his gracious XYL, Frey, LA1YM, took over after Hans left for Telemark and concluded the second evening with dinner at their beautiful apartment.

The final stop of the trip was Iceland, where we were met at the Keflavik airport by Steve, TF3SE, and Axel, TF3AX, who flew us across the fjord to the capital city of Reykjavik in Steve's Commanche. After checking in at the hotel, we QSYed to the home of John Einarsson, TF3-AC, for dinner and fellowship with the members of Islenzkir Radioamatorar. A more gracious and friendly group of amateurs we have never met, and we are indebted to Mrs. Einarsson for a fine Icelandic meal. The evening ended with a short operation from TF3IRA, club station of the Islenzkir Radioamatorar, where we were pleased to provide a new country for 4, WB8's.

No doubt about it. Only through amateur radio could one encounter this kind of worldwide friendship and hospitality.

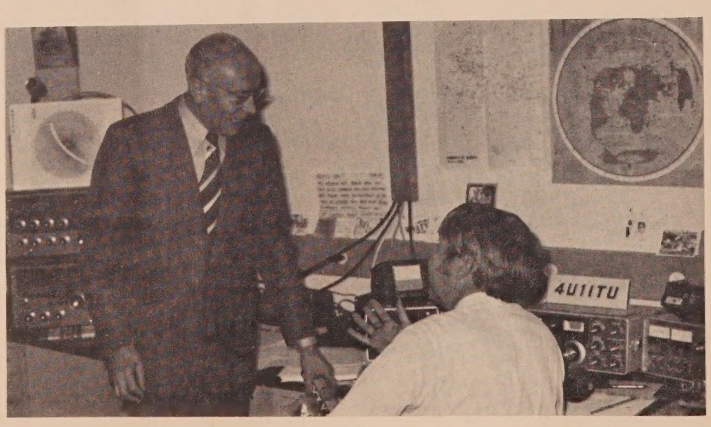
De Extra

A New Piece of Equipment: On rare occasions De Extra ventures outside the normal area of DX operations to comment on something of general interest. We are presently conducting a code class for budding Novice operators and would like to take this opportunity to describe a new teaching tool, the Atronics Model CR-101 code reader, which we are successfully using in combination with a tried and true code teaching tool, the Instructograph.

When connected to the Instructograph speaker through a small coupling transformer (500 ohms: 8 ohms), or to a receiver speaker, the CR-101 decodes character by character into an alpha-numeric display. All alpha, numeric and punctuation characters are displayed individually at the same rate they are being sent. The readout is 0.6 inches high and 0.4 inches wide, making it clearly visible to a group seated around a large table.

There is an obvious advantage in teaching the student to associate the letter with the sound immediately, without trying to count dits and dahs. Proper code receiving habits are taught from the outset and the student's code speed increases rapidly with one less learning plateau.

Not as obvious, but of equal value,



John, K4IIF, at 4U1ITU with Renato Brossa of the International Telecommunications Union. Renato is the man to see for permission to operate the station. (Photo by OH2KH)

Here is the club station, TF3IRA. Operating is CQ DX Editor, John, K4IIF, with TF3AX and TF3KB kibitzing. (Photo by TF3AC)

is the aid to proper sending. The code reader is free of bias and emotion. It is completely objective. If the number 4 is sent smoothly it rewards the student by a display of a bright and beautiful 4, but if the sending is jerkly there is a reading of HT, or would believe SET. Faulty sending habits are quickly picked up and corrected. One can argue with the instructor, but not with the code reader.

More information on the Atronics Code Reader may be obtained by contacting the company at P.O. Box 77, Escondido, CA 92025.

State Your Target

The low end of the sunspot cycle requires ingenuity by the DXer with the average rig, 50-180 watts. Bruce Hoag, W2OGE, has come up with some interesting challenges, which involve picking a band and mode, such as 20 meter c.w., and shooting for 100 DX countries or other DX fun targets such as 300 prefixes during 1976.

WPX HONOR ROLL

The WPX Honor Roll is based on confirmed *current* prefixes, which are submitted by separate application in strict conformance with the CQ Master Prefix List. Scores are based on the current prefix total, regardless of an operators all-time prefix count.

Mixed

W4LRN 1475	PA0SNG ...1091	DL1MD 940	WAØKDI ... 824	W0SFU 750
F9RM 1283	ON4QX 1088	WØAUB 929	SM7TV 822	CT1LN 749
WA6MWG ..1276	YU1BCD ...1066	WB4SIJ ... 910	W3YHR 818	WA5LOB ... 749
W2NUT 1259	WB4KZG ..1060	YU2OB 884	K7NHG 815	PY4AP 735
W9DWQ ...1250	WA6GLD ...1055	W4WSF 877	W6NJU 811	K0BLT 733
VE3GCO ...1233	W3GJY 1052	WA6JVD ... 875	W9WHM ... 811	WA6EPQ .. 713
W6TCQ 1209	W9FD 1035	DL1CF 872	WA1JMP ... 806	PAØVB 706
W3PVZ 1188	YU2DX 995	W8CNL 866	IØJX 803	W9ZTD 700
W4CRW ...1170	K6SDR 977	K3AAC 863	SM6DHU ... 803	WAØCPX ... 693
W8LY 1165	YU1AG 957	W4BYU 859	K6ZDL 802	WA6TAX ... 655
DJ7CX 1157	WA2EAH .. 950	K4KQB 853	IT9AGA 791	
W4BQY 1157	W4IC 950	G3DO 849	K2ZRO 782	
WB2FMK ..1130	I6SF 946	W6ISQ 847	JA1AG 765	
W8ROC 1130	WA5VDH .. 943	W3YHR 831	K8UDJ 750	

CW

W8LY 1150	ON4QX 920	W6TCQ 811	WA5VDH .. 729	K2ZRO 649
W8KPL 1064	DJ7CX 887	VK3AHQ ... 809	I6SF 726	K1LWI 629
DL1QT 1030	W2HO 885	W3ARK 800	WA5VDH .. 711	VE4OX 600
W2AIW 972	YU1BCD ... 883	W4BYU 768	SM5BNX ... 706	OK2QX 600
WB2FMK .. 960	VO1AW 873	YU1AG 760	VO1KE 700	
WA6MWG .. 946	G2GM 869	W4IC 754	K6ZDL 699	
W9FD 944	WA6JVD .. 814	K2AAC 736	OK2DB 693	
I4ZSQ 922	K7ABV 812	WA2HZR ... 732	W6ISQ 685	

SSB

W4NJF 1281	W9DWQ ...1011	PAØSNG ... 908	DK2BI 856	WB4SIJ ... 803
F9RM 1223	WA6MWG ..1008	F2MO 904	IT9JT 833	K4KQB 802
W3PVZ 1188	K8KDB 985	I8YRK 900	YU1BCD ... 824	W4IC 800
IØAMU 1156	DL9OH 954	WØYDB 884	W6RKP 822	DJ7CX 800
IØZV 1157	HP1JC 954	K2POA 883	W3DJZ 818	WA2EAH .. 800
W4BQY 1157	CT1PK 923	ZL3NS 874	PY3BXW ... 808	
W6TCQ 1157	I4ZSQ 922	DL1MD 858	WB2NYM .. 806	

WPX

OE2EGL ... 780	OK1MP 763	WA5LOB ... 747	WB6DXU .. 708	CR7IK 613
WB4KZG .. 770	W2EHB 750	YU1AG 727	WA6TAX ... 705	I4LCK 608
G3DO 765	WA5VDH ... 748	W6YMV 720	CX2CN 702	

Depending on the time you have available for hamming you could set a target of 50 countries in 30 days, 15 days or even 7 days. Design your target to be within reach of *your* rig and antenna in the time you have to spare. How about trying for DX from the most available continent, Europe! Even during the lowest of the sunspot lows, Europe is consistently there for DX fun, and on 20 meter c.w. the continent of Europe has over 50 DX places active.

For a variety of games Europe can be considered as 10 groups:

1. **Northwest Europe,** *10 Countries*— Finland, Norway, Sweden, Iceland, Faeroes Islands, Svalbard, Aland Island, Jan Mayen, Market Reef and Franz Josef Land.
2. **Western Europe,** *8 Countries*— England, Ireland, Scotland, Wales, Northern Ireland, Jersey, Isle of Man, and Guernsey.
3. **Southwest Europe,** *8 Countries*— France, Spain, Balearic Islands, Portugal, the Azores, Andorra, Gibraltar and Monaco.
4. **Center-West,** *5 Countries*— Germany, Netherlands, Belgium, Denmark and Luxemburg.
5. **Center-East,** *3 Countries*—East Germany, Poland and Czechoslovakia.
6. **Center-South,** *5 Countries*—Switzerland, Austria, Hungary, Liechtenstein and I.T.U. Geneva.
7. **Southern Europe,** *8 Countries*— Italy, Yugoslavia, Sardinia, Malta, Corsica, The Vatican, San Marino and Albania.
8. **Southeast Europe,** *6 Countries*— Rumania, Bulgaria, Greece, Crete, the Dodecanese and Mt. Athos.
9. **North & Mid USSR,** *6 Countries*— European Russia, Lithuania, Estonia, Latvia, White Russia and Kaliningradsk.
10. **Southern USSR,** *5 Countries*— Ukraine, Azerbaijan, Georgia, Moldavia and Armenia.

Within each group the countries are listed *roughly* in order of difficulty. For example, in group one Finland, Norway and Sweden are much easier to work than Jan Mayen, Market Reef and Franz Josef Land. For DX fun try to work all 10 groups in the fewest hours/minutes in any order at any time. Try again to beat your previous best score. Something harder? Try to QSO European groups in exact order 1-10 or 10-1 in fewest hours and minutes.

CQ's WPX award provides many combinations and challenges, as there are so many separate targets among the band and continent endorsements. If you are pursuing the 20 meter c.w. route there is an en-

The Oscar Zulu Three Pacific Ocean station which was operated by K4IIF during the visit to Denmark.

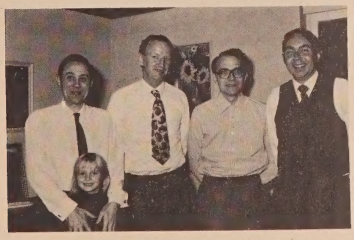
dorsement sticker for working 146 European prefixes. Other continental endorsements include North America—126, South America—88, Africa—80, Asia—68 and Oceania—51. If you wish to try some of the other bands there is a sticker for 35 prefixes on 160 Meters, 150 on 80 Meters, 250 on 40 Meters, 200 on 20, 300 on 15 and 250 on 10. Should you prefer to stay with 20 meter c.w. and shoot for total prefixes, there are stickers for 350, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950 and 1000. There was a day when 1000 prefixes seemed an impossible goal, but with so many special events stations several highly-skilled DXers have made it all the way.

The DX game is never dead. There are as many awards, challenges and pursuits as the DXer has the initiative to dig out. Go to it!

Rare Prefix News

D2—The new prefix for Angola will be D2A. *DX News-Sheet* reported ex-CR6ZB signing D2AZB in the late fall, but at press time this prefix is expected to be rather rare for sometime due to the tense political situation in that country.

FG0—Bill, WA1JKJ, made over 5000 contacts on 160-10 meters from FG0MM. QSL to WA1JKJ at 147 Lincoln St., Franklin, MA 02038.



Hosts for DX Editor K4IIF in Denmark were Poul, OZ3PO, shown holding his 8 year old daughter Lisbeth; Heinrich, OZ7HT; and Leif, OZ1LO; the Zeeland DXers. Leif was one of the group who operated from CT3 during the CQ Worldwide C.W. Contest in November. (Photo by the camera and timer of OZ3PO)

HI5—To commemorate the 50th anniversary of the Dominican Radio Club, the special station H150RCD will operate throughout 1976. QSL to P.O. Box 1157, Santo Domingo, D.N., Dominican Republic. This prefix will count as HI5 for WPX as the rules do not allow for 2 and 3 digit numbers such as 50 or 150.

HK9—This quite rare prefix has been activated by Dale, WB8QMG/HK9, who is working in a very remote area of Columbia. QSL to W8VHY.

KT4—KT4MB operated from Fort Jefferson in the Dry Tortugas from Oct. 31-Nov. 3, 1975 on 10—160 meters. QSL to W4MB, 2100 S. Nova Rd., Daytona Beach, FL 32019. At one time it was thought that this island might count as a new country under the separate administration rule, but at press time I understand that this has been ruled out.

PJ0—The special call PJ0USA has been issued to Ken Palmer, K2FJ, for use Feb. 18-March 1, 1976 on the island of St. Eustatius. Operation will be 10—160 meters on both c.w. and s.s.b. This small island in the northern group of the Netherlands Antilles played a historic part 200 years ago in the Independence of the United States, and a commemorative QSL card may be obtained via K2FJ for wishing QSO confirmation.

The WPX Program

Mixed

509...JH1MTR

CW

1431...UA1AG
1432...UK9ACP
1433...UA3ABH
1434...UD6DHU
1435...UA2AG
1436...UA1AP
1437...W6YKS

2X SSB

877...CT1QZ
878...K8PYD
879...G3YBH

VPX

93...JA0-1893-1 Yutaka Saito
94...UB5-075-174 A. G. Rogachev
95...ex-UB5-44034 George A. Chlijanc
96...UA9-154-1 Vladimir Nemtinov

Endorsements

Mixed: DJ7CX 1150; 750; W5EYY 700; WB2HNO 650; PY2ELV, W2FVS, WA2AUB, W9EVD-600; PY2ELV-550; PY2ELV-500; JH1VRQ-450
C.W.: DJ7CX-900; W4KFB-650; SP1BHX-600; K1WJB, UK4WAC, W2FVS-550; UK4WAC-500; UK4WAC-450; UK4WAC, WA2AUB-400; UK4WAC-350
S.S.B. DJ7CX 800; WA6TAX 750; K8PYD-450; K8PYD, WA2AUB-400, K8PYD, K9DHZ-350
VPX: W4-10646-750; WDX5FEB-650; OE1-101171 500; KDX1A 400; KDX1A 350.
160 Meters: DL3RK
80 Meters: W4WSF, OE1-101171
40 Meters: SP1BHX
20 Meters: SP1BHX
Asia: OE1-101171
Europe: I4BFY, JA3AEV, JH1VRQ, UA1AG, UA2AG, WA2AUB

Complete rules for WPX may be found on page 67 of the February 1972 issue of CQ. Application forms may be obtained by sending a business size, No. 10 envelope, self-addressed and stamped, to CQ DX/WPX Awards, Box 3388, San Rafael, Calif. 94902.

After many years, the DX Editors meet. Left is Dr. John Attaway, K4IIF, DX Editor of CQ, and on the right Dr. John Allaway, G3FKM, DX Editor of Radio Communication *and President of the Radio Society of Great Britain. The 2 writers with the so-similar names were the guests of Dr. Syd Sefton, G3ZBA, and the White Rose Radio Society. (Photo by G3ZBA)*

VX9—VX9A was a special operation from Sable Island by Canadian DXers Martin, VE3MR; Mort, VE3MJ; Jack, VE3GMT; and Truss, VE3IAA during the *CQ* Worldwide Phone Contest period in October. It is a new country for the *CQ* DX Awards. QSL to VE3GMT.

VY0—VY0A was a follow-up new country by the Canadian DXers. The QTH was St. Paul Island. QSL to VE3MJ.

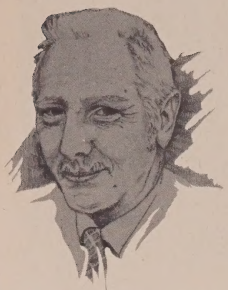
QSL Information

The WA4, WB4, WN4 QSL Bureau announces that it is sorting 1600 pounds of QSLs and has over 300,000 unclaimed DX cards and few envelopes on file. Amateurs served by this bureau are urged to send self-addressed, stamped envelopes to the Bureau's new address: c/o Sterling Park Amateur Radio Club, P.O. Box 599, Sterling Park, VA 22170.

A6XP—Via DL3RK, P.O. Box 262, 895 Kaufbeuren, West Germany.
A9XBD—To P.O. Box 14, Bahrain.
CR9AK—Cards for Dec. 3-7, 1975 operation by Northern California DX Foundation go to W6WX, Box 717, Oakland, CA 94604.
CT2BB—c/o W1EP.

(continued on page 72)

K4IIF receives the White Rose Award from the President of the White Rose Radio Society in the County of Yorkshire, England. The White Rose tradition extends back to England's famous War of the Roses. (Photo by G3ZBA)



A. EDWARD HOPPER, W2GT, ON

Awards

The February "Story of The Month", as told by Bill is:

William E. Helton, WA4LSU
All Counties #102, 4-23-73

"William E. Helton was born in New Albany, Indiana on October 10, 1919 but all but 4 years of my life, my home has been Kentucky.

"After my first heart attack in 1960, I was to slow down all my activities, thus I turned to s.w.l. This I enjoyed for about three years, becoming an amateur never entered my mind. But a couple of local friends changed that when they gave me the old pep talk, encouragement and shove I needed to try for a ticket. Chester, K4UIL (not a County Hunter) a wonderful fellow, along with Bob, WA4-DOT (who lately became a silent key) were my chief help, yes Bob was a great guy and became one of my best friends.

"January 3, 1963 was a happy day in my life, the ole Novice ticket came in the mail. My Novice year was an active one, even though I'd improved and returned to work, I made 1504 c.w. contacts. I was not chasing counties but did tally up and made USA-CA-500-#349 dated March 2, 1964 and was the second Novice to do this.

Bill, WA4LSU, and Hildred Helton.

Special Honor Roll
(All Counties)

#139 Charles "Bud" Heap, W7WVD 11-14-75.

"1966 threw me a second heart attack, but I survived and went back to work a couple more years. But in 1968, the third attack knocked me out of the working ball park and retirement was a must. After recovering enough to stay out of bed and walk to the shack, I sorta got interested and serious in county hunting. Death took my first Wife, Lorene, January 2, 1966, and I was very inactive for over a year, or I might have finished the counties sooner.

"Most of my working life I was a crane operator. Four years I was an estimater and field expeditor for a Plumbing & Heating contractor. Two years, as engineer on tow-boats running from Pittsburgh to New Orleans. Three and one half years served with the Air Force in World War II.

"I started a new and wonderful life May 27, 1967, with my new Wife, Hildred, who many of you have met. Back to normal home life, naturally, I drifted back into the shack more frequently and time consumed there increased. I endured the usual local QRM, most amateurs do, but after enjoying a few conventions and meeting so many nice people she has learned to know and love, Hildred says the "shack time" Pill is much easier to swallow. Presently she's a darn good logger and has a sharp ear for the weak-signal reports.

"Even as an old Cliff Corne'er #102 April 23, 1973, I must confess that County Hunting was not and is not my first love, working Novices is! Presently I have 3,117 Novice cards on file, and of course a few hundred never QSLed. My second hobby is fishing and relaxing at our cottage in Grayson County on Pine Knob Lake. W9ZHD can vouch for the peace and quiet back in the boon-docks where it is. A third hobby is marble collecting.

"Needless to say, but *THANKS* to all you many friends for making #102 possible.

"Max, W9SOM was sorta responsible for my last four. He made a trip to clean up Missouri (Ripley & Wayne). Scheduled his son to give me the last two in Washington. WA7-QQQ gave me Island, he was to give me my last one but could not make the sked, and two or three days later by sheer coincidence, Max heard W7VCB/7 near Lewis county and talked him into going over for my last one.

"I don't get on the Net as often as I'd like, but if you don't hear me for a spell, listen in the Novice bands for a 3 w.p.m. signal and that will be Loose Silk Undies trying to improve his code speed.

"There are a few who think they hate County Hunters. They must live in a shell or something, because the friendship, warmth, love and happiness that goes with this bunch of nuts is surpassed by none."

Awards Issued

Bud Heap, W7WVD acquired them *All* endorsed All S.S.B. His 500 and 1000 endorsed All S.S.B., All Mobiles, All 20, All 75. His 1500 and 2000 endorsed All S.S.B., All Mobiles, All 20. His 2500 and 3000 endorsed All S.S.B., All Mobiles.

Frank Koval, W8RSW added USA-CA-3000 endorsed All A-1, to his collection.

USA-CA Honor Roll

3000		2000		1000	
W7WVD	.160	W7WVD	.239	W6VK	.380
W8RSW	.161	W4CHK	.240	W7WVD	.381
W4CHK	.162	1500		WB8NVD	382
2500		W6VK	.285	W4CHK	.383
W7WVD	.203	W7WVD	.286	500	
W4CHK	.204	W4CHK	.287	W6VK	.1079
				W7WVD	1080
				W4CHK	1081

Fred Fraley, W4CHK obtained USA-CA-500 and 1000 endorsed All S.S.B., All Mobiles, All 14. USA-CA-1500 endorsed All S.S.B., All Mobiles, USA-CA-2000 endorsed All S.S.B. and Mixed 2500 and 3000.

Bill Shannon, W6VK qualified for USA-CA-500, 1000, and 1500 endorsed All S.S.B.

Randy Hatt, WB8NVD was issued USA-CA-1000.

Awards

Oscar Award: Amsat is currently offering an award for Oscar Satellite Communications Achievement Recognition to stimulate and maintain continuing interest in satellite communications by providing recognition of continuing QSO accomplishments, and to provide for recognition by

Gil Baker, W5QPX who has helped so many DX stations with POD 26s.

AMSAT of special efforts and services by all radio amateurs. The basic Award is available for confirmed satellite contacts with either (1) Twenty (20) U.S. states, Canadian call areas, other countries, or any mixture thereof, or (2) Six (6) Australian call areas and two (2) countries, or (3) Any other requirements as specified by the AMSAT Board of Directors.

All contacts made via any OSCAR spacecraft using any legal transmission mode are valid.

QSL cards or other written confirmation of contacts must show that the QSO was via an OSCAR satellite.

In lieu of such QSL cards, applicants may submit a list of contacts confirmed by the awards manager of their national amateur radio society or AMSAT affiliate organization.

All contacts must be made from the same QTH (within an area of 25 miles from a particular location).

Sufficient postage must be supplied for the return of the QSL cards submitted. The Award is free to AMSAT members and is available to nonmembers for the nominal fee of one U.S. dollar ($1.00). Endorsements are available for each ten (10) additional areas as defined above.

Applications should be forwarded to AMSAT-Award Manager, P.O. Box 27, Washington, D.C. 20044, U.S.A. AMSAT members should include their membership number.

Awards Of Japan: Many many beautiful Awards can be obtained for working Japanese stations and most Japanese Clubs as well as JARL issue these Awards. As the rules are lengthy, space will not permit me to list them all.

JARL Awards Program: For full data on these Awards—send s.a.s.e. to Awards Manager, Japan Amateur Radio League, P.O. Box 377, Tokyo Central, Japan. They issue: AJD—All Japan Districts; WAJA—Worked All Japan; HAJA—Heard All Japan; Japan Century Cities—JCC; HAC—Heard All Continents; ADXA—Asian DX Award; WACA—Worked All Cities Award; HACA — Heard All Cities Award.

JDXRC: The Japan DX Radio Club founded in 1950 as the first DX Club in Japan issues the WJDXRC and HJDXRC) Worked and Heard Japan DX Radio Club) Awards to any licensed amateurs and s.w.l.s all over the world. All contacts must be made after 29 July 1952. Stations outside Japan must work (or hear) 5 club members. Stations in Japan must work (or hear) 10 club members. QSLs need not be sent, however a certified list of claimed contacts, signed by any recognized Radio Club officer or two amateurs may be submitted. If QSLs are sent, sufficient postage for their return must be included. Fee is 6 IRCs or 300 Yen (No stamps, please). Send to JDXRC Award Manager, Kazuo Kokazi, JA3-KWJ, 6-16 Higashinakano, Yokaichi, Shiga 527, Japan. Send s.a.s.e. for latest list of club members.

Editor's Notes

The members of Club SK5IM are proud to introduce their book *Counties in Maps*. They feel convinced that it will be of great help to anyone who is working for USA-CA. The complete book contains 103 pages with 50 maps and lists of all counties. Copies cost $5.00 or the equivalent sum in any other currency or 20 IRCs—this cost includes postage to all parts of the world. Send your money and QTH to: Club SK5IM, P.O. Box 43, S-591 04 Motala 4, Sweden.

OSCAR Award.

WA9TSG, Joe Williams, 114 East Brown Street, Milwaukee, Wisc. 53212, has ideas of publishing a booklet on Awards and would like to receive data/rules on Awards.

Sorry that lack of space will postpone my story about meeting, after over 50 years, my friend who gave me my first QSO. How was your month? 73, Ed. W2GT

FREE CLASSIFIED ADS IN CQ'S

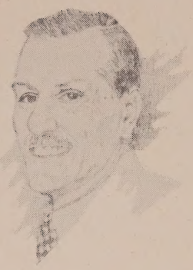
HAM SHOP

So the 100TH's finally gave up the ghost and your Leyden jar is out of Leyden . . . . now what? It's time to either replace or renew . . . and quickly.

Here's your chance to locate those hard to find gems or to get into the swing of things by buying a new rig to grace your QTH.

Take some time and fill out the coupon on page 76 (that's the spirit) to get in on CQ's FREE CLASSIFIED ADS. You can buy, sell or swap your way into anything you need (electronic that is) pronto.

Ads will be run first come first serve as space permits and with CQ's new format that means a lot of space. 803's anyone?



Contest Calendar

BY FRANK ANZALONE, W1WY

We received a beautiful computorized contest log from DK2BI, the multi-multi phone operation by a group of the Saar-Pfalz DX Club members.

This is a log checker's dream, over 4500 contacts and not a single dupe to be checked, 413 had already been taken out by the computor. The computor performed a dual service, saved us the job of checking the log for duplicate contacts, and gave us a list of stations that we in turn should check.

A certain WA2's log is going to get a thorough checking, his call appeared nine (9) different times in DK2BI's 15 and 20 meter operation.

Conditions during the c.w. section of our contest in November were pretty miserable, as forecast by W3ASK. Guess we'll have to give George credit for another correct prediction. But hope it will be for a more favorable forcast next time. Maybe for the WPX SSB week-end?

A clarification in the "USA WPX '76" award requirements. Contacts may be made on any band or mode and not confined to s.s.b. only. No special endorsements are available but each certificate will be numbered. So rush your application if you want to be at the top of the Totem Pole. Good luck.

73, for now, Frank, W1WY

Commonwealth Contest

Starts: 1200 GMT Saturday, March 13
Ends: 1200 GMT Sunday, March 14

This is the old BERU contest and eligibility is limited to RSGB residents in the United Kingdom and amateurs licensed to operate within the British Commonwealth or British Mandate Territories. This should be of special interest to our Canadian friends and to the Caribbean area.

Activity will be on c.w. only, and it is requested that operation be confined to the lower 30 kHz of each band.

Calendar of Events

*Feb.	7-8	ARRL DX Phone Contest
*Feb.	13-15	QCWA QSO Party
*Feb.	14-15	10-10 Net QSO Party
*Feb.	21-22	ARRL DX C.W. Contest
*Feb.	21-22	YL-OM Phone Contest
*Feb.	28-29	French Phone Contest
Mar.	6-7	ARRL DX Phone Contest
Mar.	6-7	YL-OM C.W. Contest
Mar.	13-14	Commonwealth Contest
Mar.	13-15	Virginia QSO Party
Mar.	14-15	South Dakota QSO Party
Mar.	20-21	ARRL DX C.W. Contest
Mar.	**27-28**	**CQ WW WPX SSB Contest**
Mar.	27-28	Tennessee QSO Party
Mar.	27-29	BARTG Spring RTTY
Apr.	3-4	Florida QSO Party
†Apr.	3-4	Polish C.W. DX Contest
Apr.	24-25	PACC DX Contest
Apr.	24-25	Bermuda Phone Contest
May	1-2	Swiss "H-22" Contest
May	8-9	Bermuda C.W. Contest

*Covered in last month's Calendar
†Not official

Exchange: Just a signal report.

Scoring: Each completed contact counts 5 points. In addition a bonus of 20 points may be claimed for the 1st, 2nd and 3rd contact with each Commonwealth call area. (All of the British Isles count as one call area.)

Entries may be single or multi-band, with seperate log sheet required for each band. Add totals from each band for your final multi-band score. Multi-band entries are not eligible for single band awards but may request a single band to be judged for competition.

There is also a *s.w.l.* category with scoring same as above. Report of station heard as well as call of station being worked should be listed. Credit may be claimed for both entries. Include a check list of call areas heard on each band.

Awards: Certificates to the first three places multi-band UK and overseas stations. And to single band winners on each band, both UK and overseas. There are Rose Bowl Trophies to the overall winner and runner-up and to the leading UK station.

Logs go to: D. J. Andrews, G3MXJ, 18 Downview Crescent, Uckfield, Sussex, England. And must be received before May 17th to be eligible.

Virginia QSO Party

Starts: 1800 GMT Saturday, March 13
Ends: 0200 GMT Monday, March 15

This one is again sponsored by the Sterling Park ARC. The same station may be worked on each band and mode, 1.8 thru 28 MHz, for QSO points. And Va. stations may work other in-state stations for QSO and multiplier credit.

Exchange: QSO. no., RS(T) and QTH. County for Va., state, province or country for others.

Scoring: One point per QSO. Va. stations multiply total QSO points by sum of states, provinces, countries and Va. counties worked. Others use Va. counties for their multiplier. (max of 98)

Frequencies: CW. — 60 kHz from low end of each c.w. and novice bands. Phone — 3930, 7230, 14285, 21375, 28575. (Check phone bands on even GMT hours.)

Awards: Certificates to top scorers in each state, province, country and Va. county. Also top scoring Novice in and out of state. A special certificate to the leading out-of-state scorer.

Indicate each new multiplier worked in a separate column on your log and include a check and summary sheet with name, address and etc.

Logs must be received by April 15th and go to: Gary D. Poorman, W4UPJ, 1114 S. Dickenson Ave., Sterling Park, VA 22170.

South Dakota QSO Party

Starts: 1400 GMT Sunday, March 14
Ends: 0200 GMT Monday, March 15

This one is sponsored by the Prairie Dog A.R.C. The same station may be worked on each band and mode for QSO and multiplier credit.

Exchange: RS(T) and QTH, county for South Dakota; state, province

or country for others.

Scoring: SD stations multiply total QSOs by states, provinces and countries worked. Others use SD counties for their multiplier.

Frequencies: C.W. — 70 kHz up from bottom of each band. Phone— 1975, 3955, 7230, 14280, 21370, 28510.

Awards: Certificates to highest scoring single and multi-operator station in each section. (ARRL?)

Include a summary sheet showing the scoring and a signed declaration and mail before April 30th to: Lowell Nelson, WBØEVQ, Box 493, Springfield, South Dakota 57062.

Tennessee QSO Party

Two Periods (GMT)
2100 Sat. March 27 to
0500 Sun. March 28
1400 to 2200 Sunday, March 28

Many counties with low activity will be activated by portable and mobile stations for this Party. The same station may be worked on each band and each mode. Mobile and portables in each county change. Tenn. stations may work other in-state stations.

Exchange: Signal report and QTH. County for Tenn., state, province or country for others.

Scoring: One point per QSO for phone contacts, 1½ points for c.w. Tenn. stations multiply total QSO points by sum of states, provinces and Tenn. counties worked. Out-of-state stations, QSO points by Tenn. counties worked. (max. of 95)

There is a 200 point bonus for Tenn. mobile and portable stations for each county change outside own county. (min. of 5 QSOs each county)

Frequencies: 3500, 3725, 7050, 7125, 14050, 21050, 21125, 28050, 28125 on c.w. 3980, 7280, 14280, 21380, 28580 on phone. Repeater contacts not allowed.

Awards: Certificates to each station submitting a log with 10 or more contacts. Plaques to top scores in and outside Tenn. and winning portable and mobile stations.

Use a separate log sheet for each band with over 25 QSOs, and a check sheet for logs with over 100 contacts. There is a disqualification clause for Tenn. stations soliciting contacts from non-contestants. (?)

Mailing deadline is April 25th to: Dave Goggio, W40GG, 1419 Favell Drive, Memphis, Tenn. 38116. Include s.a.s.e. for results.

BARTG Spring RTTY Contest

Starts: 0200 GMT Saturday, March 27
Ends: 0200 GMT Monday, March 29

This contest sponsored by the British Amateur Radio Teleprinter Group is open to all amateurs and s.w.l.'s.

All bands may be used, 3.5 thru 28 MHz, but not more than 30 hours out of the 48 hour contest period may be used for scoring. The 18 hours off may be taken any time but in not less than 3 hour periods. Indicate on/off times in your log.

Exchange: RST plus a progressive 3 figure contact number starting with 001 and time in GMT.

Points: Contacts with stations within ones own country 2 points. With stations in other countries 10 points. A bonus of 200 points per country worked including one's own, on each band. The same station may be worked on each band for QSO and multiplier credit.

Multiplier: Total sum of countries worked on each band. And number of continents worked. (counted only once) Use the ARRL country list and each W/K and VE/VO call area.

Final Score: (a) Total QSO points × country multiplier. (b) Country multiplier × bonus points × continents worked. Add sum of (a) and (b) for final score.

Awards: Certificates to the leading scorers in each class and also each continent, and each W/K and VE/VO call areas. Final position will be valid for entry in the World RTTY Championship. There are also awards for working 25 countries and for 6 continents.

Logs must be received by May 31st and go to: Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex, England EN1 4DX.

CQ WW WPX SSB Contest

Starts: 0000 GMT Saturday, March 27
Ends: 2400 GMT Sunday, March 28

Complete rules will be found on page 36 of last month's issue. (Jan.) No changes from previous years. Rest periods, double QSO points for contacts on 40, 80 and 160, and the multiplier is counted only *once,* not once per band.

We have however added an extra multiplier for contacting USA stations using the special Bi-Centennial prefixes. This year's contest is putting special emphasis on the "USA WPX '76" achievement award. Therefore if you work a USA station using a special Bi-Centennial prefix you get credit for a double multiplier. (2)

Contacts made in the contest may be applied toward the "USA WPX '76" award. The requirements are that you work at least 200 special prefix stations, and at least 35 of the 200 must be *different* prefixes. You will find detailed rules and requirements on page 27 of October *CQ.*

1975 Contest Results
French Contest

C.W.

U.S.A.

K1OME	24,255	W1PIV	9,746
W1VH	5,012	F2YS/W2	2,376
W1OPJ	310	W4WSF	360
WB2NDR	1,560		
WA2SRH	415		
W3ARK	14,569		
W3QA	3,840		
K3NTD	75		
W4JUK	2,261		
W4WSF	946		
K5ETA	5,558		
K7AL	270		
W8KPL	25,410		
W8VSK	10,640		
W8DSO	3,920		
W9OHH	9,980		
W9RJM	12		
WB9NME	3		

Canada

VO1AW	20,215
VE3BBH	18,752
VE3EJK	3,014
VE3BR	2,436

PHONE

U.S.A.

Canada

VE3BS	30,615
VE3BBH	26,784
XK3EUP	14,153
VE3GCO	5,814

We have also added an all band Canadian Trophy (VE3EUP) and a Contest Mgr's DX-Pedition Award. (W8IMZ) So there's a lot going for you in this one and should make for an interesting week-end.

A s.a.s.e. to *CQ* will get you all the information if you do not have the October or January issues handy. Also log forms and summary sheets for the contest, and "USA WPX '76" application forms. You are expected to apply for the Award even though you have fulfilled the requirements in your contest log.

The mailing deadline for contest logs has been extended to May 10th this year. They go to: *CQ* WPX SSB Contest, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

Florida QSO Party

Three Periods (GMT)
1500 to 2000 Saturday, April 3
0000 to 0500 Sunday, April 4
1400 to 2400 Sunday, April 4

This is the 11th annual QSO Party sponsored by *Florida Skip.*

Phone and c.w. are separate contests. The same station may be worked on each band for QSO points. Floridians may work in-state stations but for QSO points only.

Exchange: RS(T) and QTH. County for Fla., state, province or country for others.

Scoring: 1 point per QSO. Fla. use states, (49) provinces, (12) and DX

(continued on page 72)

PACC Contest

W2EQK	1,023	W3ARK	240
WB4OGW	510	VE3EJK	162

The new contest manager, PA0DIN reported that the address listed for last year's contest was no longer valid, and the P.O. Dept. had returned many logs rather than forward them to the new address. This accounts for the very poor showing. The new address is VERON, P.O.B. 1166, Arnhem, Netherlands.

GEORGE JACOBS, W3ASK, ON

Propagation

The Swiss Federal Solar Observatory reports a mean monthly sunspot number of 19 for November, 1975. This results in a *smoothed sunspot number* of 17, centered on May, 1975. A smoothed sunspot number of 9 is forecast for February, 1976, as the present cycle continues its slow decline towards a minimum value.

Low solar activity coupled with normal seasonal changes in h.f. propagation conditions is expected to result in very few *10 Meter* DX openings during February. The band may occasionally open towards southern and tropical areas during the daytime when conditions are HIGH NORMAL or better. There's a somewhat better chance for *15 Meter* DX openings to many parts of the world during the daylight hours, especially when conditions are HIGH NORMAL, or better.

Twenty meters should continue to be the best band for DX propagation during February. Look for a DX window of an hour or two duration, beginning just after sunrise, during which the band should open to most areas of the world. DX should be possible throughout the day, with another peak in conditions expected during the early afternoon. When conditions are HIGH NORMAL or better, *20 Meters* should stay open to some areas of the world well into the hours of darkness, and possibly as late as Midnight.

Good nighttime DX propagation conditions are expected on *40 Meters* during February. The band should open towards Europe and the east an hour or so before sundown, peaking during the early evening. South America should be within range from about 7 p.m. and until sunrise. Look for openings towards the South Pacific, Asia and the Far East from about an hour or two before to about an hour after local sunrise. Good *80 Meter* openings are also forecast to most areas of the world during the hours of darkness. Be sure to also check *160 Meters* between sundown and sunrise for fairly good DX openings to many areas of the world.

A seasonal increase in static levels may begin to be noticeable on the h.f. bands during February.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For Feb. 1976

Propagation Index	*Expected Signal Quality* (4)	(3)	(2)	(1)
Date				
Above Normal: 8	A	A	B	C
High Normal: 4-5, 9-10, 26, 28	B	B	C	D
Low Normal: 1-3, 6-7, 11, 18-19, 24-25, 27, 29	B	C	D	E
Below Normal: 12, 15-17, 20-21, 23	C	D	E	E
Disturbed: 13-14, 22	D-E	E	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with *a propagation index* of (3) will be *fair* (C) Feb. 1-3, *good* (B) on the 4th and 5th, and *fair* (C) again on the 6th and 7th, etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 86, Northport, NY 11768, or check WWV at 14 minutes past each hour.

Short-Skip Conditions

On *160 Meters,* no significant skip is expected during the daylight hours, but up to 1300 miles and beyond should be possible on a regular basis during most of the hours of darkness. On *80 Meters,* expect openings up to about 250 miles during most of the daylight hours, with the skip lengthening to between 400 and 1300 miles just after sundown, and between 800 and 2300 miles by Midnight. On *40 Meters,* daytime skip should be possible between approximately 250 and 750 miles, extending to between 750 and 2300 miles during the early evening. During the hours of darkness expect to work *40 meter* stations within a range of between 1500 and 2300 miles. Daytime skip on *20 Meters* should range between 750 and 2300 miles through the late afternoon. During the late afternoon and until just after sundown it should lengthen to between 1500 and 2300, with the band out for short-skip by 8 p.m. on most nights. On *15 Meters,* skip should range between 1300 and 2300 miles during most of the daylight hours, with the band going dead for short-skip about an hour or so after local sundown. Occasional short-skip openings may also be possible on *10 Meters.*

V.h.f. Ionospheric Openings

Best chances for unusual ionospheric openings should be during periods of radio storminess on the h.f. bands. Check the "Last Minute Forecast" at the beginning of this column for days during February that are expected to be BELOW NORMAL or DISTURBED. Check the v.h.f. bands on these days for auroral-type and sporadic-E short-skip openings.

No significant meteor showers expected during February.

73, George, W3ASK

February 15-April 15, 1976

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Central Europe & North Africa	10-12 (1)* 08-10 (1) 10-12 (2) 12-13 (1)	06-08 (1) 08-11 (2) 11-12 (3) 12-13 (4) 13-14 (3) 14-15 (2) 15-17 (1)	16-17 (1) 17-19 (2) 19-20 (3) 20-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-20 (1) 20-21 (2) 21-01 (3) 01-02 (2) 02-03 (1) 20-22 (1)* 22-01 (2)* 01-02 (1)*
Northern Europe & European USSR	09-12 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-14 (2) 14-16 (1)	17-19 (1) 19-02 (2) 02-03 (1)	20-22 (1) 22-00 (2) 00-02 (1) 20-00 (1)*

Eastern Mediterranean & Middle East	09-11 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-13 (2) 13-14 (3) 14-15 (2) 15-17 (1)	18-20 (1) 20-23 (2) 23-01 (1)	19-23 (1) 20-22 (1)*
Western Africa	10-13 (1)** 09-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-19 (1)	18-19 (1) 19-00 (2) 00-02 (1)	19-21 (1) 21-23 (2) 23-01 (1) 21-01 (1)*
Eastern & Central Africa	11-13 (1)** 09-11 (1) 11-14 (2) 14-15 (1)	13-15 (1) 15-18 (2) 18-19 (1)	19-22 (1) 22-00 (2) 00-01 (1)	20-00 (1)
Southern Africa	10-13 (1)** 09-10 (1) 10-12 (2) 12-13 (3) 13-14 (2) 14-15 (1)	07-14 (1) 14-16 (2) 16-17-(3) 17-18 (2) 18-20 (1)	18-20 (1) 20-22 (2) 22-00 (1)	21-23 (1) 21-23 (1)*
Central & South Asia	09-11 (1) 16-18 (1)	06-07 (1) 07-09 (2) 09-11 (1) 18-21 (1)	04-07 (1) 17-21 (1)	04-07 (1) 18-20 (1)
Southeast Asia	17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	05-08 (1) 19-21 (1)	06-07 (1) 19-21 (1)
Far East	16-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 17-20 (1)	05-08 (1) 17-19 (1)	06-07 (1) 17-18 (1) 06-07 (1)*
South Pacific & New Zealand	14-16 (1) 12-15 (1) 15-18 (2) 18-19 (1)	15-19 (1) 19-22 (2) 22-07 (1) 07-09 (2) 09-11 (1)	00-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-08 (1)	02-03 (1) 03-06 (2) 06-07 (1) 02-07 (1)*
Australasia	15-17 (1)** 09-11 (1) 22-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (2) 09-15 (1) 15-17 (2) 17-18 (1) 18-20 (2) 20-22 (1)	03-05 (1) 05-07 (2) 07-08 (1)	04-05 (1) 05-06 (2) 06-07 (1) 04-07 (1)*
Caribbean, Central America & Northern Countries of South America	11-16 (1)** 07-08 (1) 08-09 (2) 09-11 (4) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-19 (1) 19-20 (2) 20-03 (3) 03-05 (2) 05-07 (1)	19-21 (1) 21-04 (2) 04-06 (1) 20-02 (1)* 02-04 (2)* 04-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	12-15 (1)** 08-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-20 (2) 20-22 (1) 22-23 (2) 23-00 (1)	19-21 (1) 21-04 (2) 04-07 (1)	21-06 (1) 01-05 (1)*
McMurdo Sound, Antarctica	15-17 (1)	17-19 (1) 19-22 (2) 22-00 (1) 07-09 (1)	22-00 (1) 00-04 (2) 04-06 (1)	00-04 (1)

February 15-April 15, 1976
Time Zones: CST & MST
(24-Hour Time)
CENTRAL USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Southern Europe & North Africa	08-09 (1) 09-12 (2) 12-13 (1)	06-08 (1) 08-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	16-18 (1) 18-21 (2) 21-00 (1) 00-02 (2) 02-03 (1)	18-20 (1) 20-00 (2) 00-01 (1) 20-00 (1)*
Northern & Central Europe & European USSR	08-11 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-13 (2) 13-15 (1)	19-22 (1) 22-00 (2) 00-02 (1)	20-01 (1) 21-01 (1)*
Eastern Mediterranean & Middle East	08-11 (1)	07-11 (1) 11-14 (2) 14-16 (1) 22-00 (1)	19-20 (1) 20-22 (2) 22-23 (1)	20-22 (1)
Western Africa	09-12 (1)** 08-10 (1) 10-13 (2) 13-15 (1)	07-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 71-18 (1)	18-20 (1) 20-22 (2) 22-01 (1)	21-00 (1) 21-23 (1)*
Eastern & Central Africa	08-11 (1) 11-13 (2) 13-14 (1)	07-12 (1) 12-14 (2) 14-15 (3) 15-16 (2) 16-18 (1)	19-23 (1)	19-22 (1)
Southern Africa	10-12 (1)** 08-10 (1) 10-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-13 (1) 13-15 (2) 15-16 (3) 16-17 (2) 17-19 (1) 22-00 (1)	18-20 (1) 20-23 (2) 23-00 (1)	19-22 (1) 20-22 (1)*
Central & South Asia	09-11 (1)	06-07 (1) 07-09 (2) 09-11 (1) 19-21 (1)	04-08 (1) 17-21 (1)	05-07 (1) 17-19 (1)
Southeast Asia	10-13 (1) 17-19 (1)	06-07 (1) 07-10 (2) 10-12 (1) 17-21 (1)	04-08 (1) 17-19 (1)	05-07 (1) 17-18 (1)
Far East	16-18 (1)** 16-17 (1) 17-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	02-04 (1) 04-07 (2) 07-08 (1)	04-07 (1) 05-07 (1)*
South Pacific & New Zealand	14-17 (1)** 11-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-10 (2) 10-18 (1) 18-19 (2) 19-21 (3) 21-23 (2) 23-02 (1)	22-00 (1) 00-01 (2) 01-06 (3) 06-07 (2) 07-08 (1)	00-02 (1) 02-06 (2) 06-07 (1) 03-07 (1)*

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings

3. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this Propagation column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Time shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M., 13 is 1 P.M., etc. Appropriate *standard* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate Chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 14 in Washington, D.C. is 19 GMT. When it is 20 in Los Angeles it is 04 GMT, etc.

5. The charts are based upon a transmitter power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level: for each 10 db loss, it will lower by one level.

6. Propagation data, contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

Australasia	14-17 (1)** 12-16 (1) 16-18 (2) 18-20 (1)	06-07 (1) 07-09 (3) 09-12 (2) 12-15 (1) 15-17 (2) 17-19 (1) 19-21 (2) 21-00 (1)	01-04 (1) 04-06 (3) 06-07 (2) 07-08 (1)	04-05 (1) 05-06 (2) 06-07 (1) 05-07 (1)*
Caribbean, Central America & Northern Countries of South America	11-15 (1)** 07-08 (1) 08-09 (2) 09-11 (3) 11-13 (2) 13-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-10 (3) 10-15 (2) 15-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-02 (3) 02-05 (2) 05-07 (1)	19-21 (1) 21-04 (2) 04-06 (1) 20-02 (1)* 02-04 (2)* 04-05 (1)*
Peru, Bolivia, Paraguay Brazil, Chile, Argentina & Uruguay	12-14 (1)** 07-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	05-07 (1) 07-09 (2) 09-12 (1) 12-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1) 22-00 (2) 00-01 (1)	19-20 (1) 20-04 (2) 04-06 (1)	21-05 (1) 01-04 (1)*
McMurdo Sound, Antarctica	15-17 (1)	16-19 (1) 19-22 (2) 22-00 (1) 07-10 (1)	22-01 (1) 01-04 (2) 04-06 (1)	01-04 (1)

February 15-April 15, 1976
Time Zone: PST (24-Hour Time)
WESTERN USA TO:

	15 Meters	*20 Meters*	*40 Meters*	*80 Meters*
Western & Southern Europe & North Africa	08-11 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-14 (1) 22-00 (1)	19-22 (1) 22-00 (2) 00-01 (1)	19-22 (1) 20-22 (1)*
Northern & Central Europe & European USSR	08-10 (1)	06-07 (1) 07-09 (2) 09-11 (1) 11-12 (2) 12-13 (1) 22-00 (1)	19-21 (1) 21-22 (2) 22-23 (1)	19-22 (1) 20-22 (1)*
Eastern Mediterranean & Middle East	08-10 (1)	07-10 (1) 10-11 (2) 11-13 (1) 22-00 (1)	18-21 (1)	18-20 (1)
Western Africa	09-10 (1)** 08-09-(1) 09-12 (2) 12-14 (1)	05-07 (1) 07-08 (2) 08-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-18 (1)	18-22 (1)	19-21 (1) 19-21 (1)*
Eastern & Central Africa	09-11 (1)	06-08 (1) 11-13 (1) 13-15 (2) 15-16 (1)	18-21 (1)	18-20 (1)
Southern Africa	09-11 (1)** 08-10 (1) 10-13 (2) 13-14 (1)	05-06 (1) 06-08 (2) 08-13 (1) 13-17 (2) 17-18 (1) 23-01 (1)	18-22 (1)	19-21 (1) 19-21 (1)*
Central & South Asia	08-10 (1) 18-20 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-21 (1)	05-08 (1) 17-19 (1)	05-07 (1) 17-18 (1)
Southeast Asia	16-18 (1)** 08-10 (1) 16-17 (1) 17-18 (2) 18-19 (1)	02-07 (1) 07-09 (2) 09-11 (1) 16-17 (1) 17-19 (2) 19-20 (1)	02-04 (1) 04-06 (2) 06-08 (1)	05-07 (1)
Far East	14-16 (1) 16-18 (2) 18-19 (1)	06-07 (1) 07-09 (2) 09-14 (1) 14-16 (2) 16-19 (3) 19-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-06 (3) 06-07 (2) 07-08 (1)	02-03 (1) 03-06 (2) 06-07 (1) 03-06 (1)*
South Pacific & New Zealand	15-17 (1)** 11-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-20 (1)	06-09 (1) 09-11 (2) 11-16 (1) 16-18 (2) 18-19 (3) 19-21 (4) 21-22 (3) 22-00 (2) 00-04 (1)	21-22 (1) 22-06 (3) 06-08 (2) 08-09 (1)	22-00 (1) 00-06 (2) 06-07 (1) 22-00 (1)* 00-06 (2)* 06-07 (1)*
Australasia	15-17 (1)** 14-16 (1) 16-19 (2) 19-20 (1)	07-08 (1) 08-11 (2) 11-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-23 (1)	00-02 (1) 02-03 (2) 03-06 (3) 06-07 (2) 07-08 (1)	02-03 (1) 03-06 (2) 06-07 (1) 03-06 (1)*
Caribbean, Central America & Northern Countries of South America	10-14 (1)** 07-08 (1) 08-12 (2) 12-14 (3) 14-16 (2) 16-17 (1)	05-06 (1) 06-07 (2) 07-09 (4) 09-14 (2) 14-16 (3) 16-18 (4) 18-20 (3) 20-22 (2) 22-02 (1)	18-19 (1) 19-20 (2) 20-01 (3) 01-04 (2) 04-06 (1)	19-20 (1) 20-03 (2) 03-04 (1) 20-01 (1)* 01-03 (2)* 03-04 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	10-15 (1)** 07-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-21 (2) 21-23 (1)	18-20 (1) 20-03 (2) 03-05 (1)	20-04 (1) 22-03 (1)*
McMurdo Sound, Antarctica	13-15 (1) 15-17 (2) 17-18 (1)	16-19 (1) 19-22 (2) 22-02 (1) 06-07 (1) 07-09 (2) 09-11 (1)	22-02 (1) 02-05 (2) 05-06 (1)	02-05 (1)

* Indicates Best Time For 160 Meter Openings.
** Indicates Best Time For 10 Meter Openings.

Surplus Sidelights

BY GORDON ELIOT WHITE

Mail, Mail, Mail. I get a sporadic flow of letters from readers—some months it's light, some months it is not. I would say that right now it was on the heavy side, indicating, possibly, that an interest in surplus was alive and growing again.

The most interesting thing about the mail of the last few months has been the emphasis on basics, on finding standard signal generators, 'scopes, and receivers and transmitters less than exotic, but good, sound, and *cheap*. This is the kind of equipment that can still be found in surplus today, even though it is not the newest thing in the State of the Art.

K3ITG writes, for example, that he has just opened a radio shop in Landisville, Pa., and needs basic test equipment. A reader from Madison, Ohio, writes for more information on the BC-348; I even had a letter about some Canadian Air Force Command transmitters, and the query: can these be converted to anything useful?

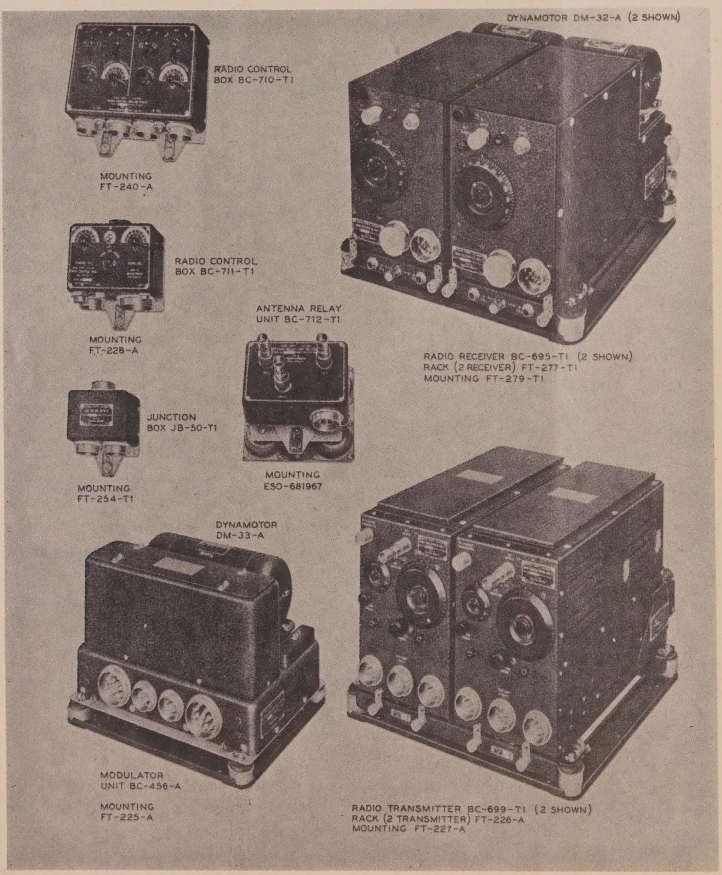


Fig. 1—Major components for u.h.f operation of the SCR-274-N.

Obviously, the World has turned 'round again, bringing a new generation of surplus hounds.

For those readers, then, and for some older *CQ* subscribers who may have forgotten, I am going to continue to go over the older surplus items, for example the Command Sets.

For those who have but recently joined us, let me assure you that yes, there is quite a bit that can be done with Command Sets, both the transmitters and the receivers. *CQ* was the first publication to realize the vast popularity of these units, and Cowan Publishing Co. put out an entire book on them, 'way back in 1957. The original *Command Sets* is now out of print, replaced in part by *CQ*'s *Surplus Conversion Handbook* ($3).

Not that *CQ* had any monopoly on Command Set conversions. These began appearing in 1947 in all the amateur and radio magazines, and continue today, an incredible 28 years later.

Command transmitters probably got more Novices on the air than any other piece of surplus equipment from World War II up until 1970. They have been modified for f.m., sideband, and RTTY, fixed and mobile, simple or complex. The Command Receivers represented a technical elegance not matched in either commercial or military equipment for more than three decades.

Conversion articles on Command Sets have been a staple of amateur publications, and by digging through any library with back issues of *CQ*, *QST* or *73* a reader can find a discussion of every conceivable use to

which these versatile units can be put. One rather obscure and short-lived magazine, *Western Radio Amateur* even carried the design for converting the BC-453 receiver into a sideband transmitter.

Surplus Conversion Handbook, published in 1964, covers all the basics: specifications, power supplies, conversion to crystal control, changing frequency coverage, removing television interference, etc.

The most numerous Command Transmitters were a series of five, covering frequencies from 2.1 MHz to 9.1 MHz. These were found in virtually every Allied aircraft used in World War II. The five companion receivers covered 190 kHz to 9.1 MHz. When Very High Frequencies were adopted, an add-on crystal controlled receiver and transmitter were designed to cover 100-156 MHz, fitting the original racks and using the same modulator and many of the same accessories. The SCR-522 was more widely used for amateur v.h.f. work in the 1940's and 1950's, chiefly because only a handful of the fine tuneable AN/ARC-5 v.h.f. sets were built, the crystal-controlled jobs being more difficult to convert.

I have dealt in these pages with virtually all of the different Command Set units, and have related their history in detail.

One of the more rare Command Sets is the Western Electric v.h.f. design, receiver BC-695 and transmitter BC-699, part of the SCR-274-N. These units were put together by Western Electric on a 1941 Contract at the same time that Aircraft Radio Corporation was working out the R-112 and R-113 receivers—and the T-89 and T-90 transmitters. (The competition and overlap of a number of defense contractors contributed greatly to the vast proliferation of Command Set items in surplus).

Fig. 1 shows the major items of the Western Electric v.h.f. design.

The transmitter operated on any of four channels in a two MHz segment of the band 124-155 MHz, and the receiver could be adjusted to cover any two MHz between 122-146 MHz.

Actually, the BC-695/699 design didn't get off the ground in any numbers. It was updated by Western Electric to BC-942/950 by adding a motor-tuner and spreading the coverage to 100-156 MHz. Before that got into wide use the Navy had taken over the entire affair, modified the plugs and controls to work with the AN/ARC-5 system, and re-numbered the receiver as R-28 and the transmitter as T-23.

The BC-942/R-28 receiver can be easily modified for tuneable operation by removing the grid bypass capacitor (C-163) from pin 4 of the 6SH7 oscillator V-108. Run a .0001 ufd capacitor from pin 1 of V-108 to L-111 at the point where R-152 (1K) is connected. This gives the feedback to make the former crystal oscillator take off on its own, tuned by the motor-driven multi-stage capacitor.

I doubt there is anywhere near enough stability in the receiver as converted to make motor-tuning any use, and there is no vernier dial, but the set may be adjusted via the thumbwheel dial which appears at the top front of the set.

This particular conversion is all right for sitting on one 2-meter frequency, but since re-tuning is tedious, the practical thing would be to get a set of crystals and operate as the receiver was designed. To figure what rocks you need, subtract the intermediate frequency (6.9 MHz) from the intended channel frequency and divide by 24, i.e. a 5.7125 MHz crystal will tune 144 MHz.

For greater detail on the v.h.f. sets, readers might want to look at back issues of *CQ,* notably March 1967 p. 90, Nov. 1962, VHF column, June 1957 surplus column, Dec. 1953, July 1960, June 1959, April 1957. ■

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Our Readers Say *(from page 7)*

plug. I might add (hope you don't mind) that we're calling it the N.Y. ARRL Convention this year — but there will be no change whatsoever in our format, same place, layout, exhibitors, flea market, etc. . .the reason: the ARRL gang seems to like the Rochester Hamfest and turn out in full force, so if they are there let's give them recognition — but we're very firm on keeping the same old Rochester Hamfest approach.

Just dropped a letter to Bill Orr re: the AGS! Am I glad AWA has one before he wrote the article - hi. He is correct, there are very few of these classics around, and as a result of his article the price will really go up. Nice work Bill. His articles are well written and technically foolproof. You have a good man there Dick. Hope he writes more and in the meantime I plan to review his article in the next issue of AWA Bulletin.

Bruce Kelly, W2ICE
Holcomb, NY

Editor, *CQ*:

Regarding your editorial in November, 1975 *CQ* (which I received on December 20). I could summarize my opinion of your comments on Conventions with one word starting with "Bull". But, I shall respond in a more gentlemanly manner. The title "Zero Bias" is appropriate for your comments, I'll agree — for the amount of thought provoking, constructive criticism in this editorial amounts to exactly zero.

I see absolutely nothing wrong with any fraternal, social, professional, business, or industry association holding an annual convention as a means of highlighting the common activity which binds them together. I disagree completely with your accusations that ARRL (your favorite nitpickee) Conventions are "private parties, by invitation only". Anyone with an interest in ham radio (or otherwise) can and do attend. This is probably more true with ARRL conventions than most of the other types mentioned above.

Your suggestion that they be eliminated solely on the basis of cost and apparently distance is pure bunk. I recognize some of us may not be able to afford to go, but if we carry the analogy further, why not eliminate all conventions of whatever nature? Ridiculous, of course. There are simply a multitude of hamfests, and hamventions frequently held all across our land which also serve a definite need at low cost and can accommodate those of us who are unable to attend a convention for whatever reason.

You praise the Dayton Hamvention and the Hamburg International Hamfest as typical alternatives. But how many of these same non-Hams, 13 year old kids, unemployed or CBers - or for that matter, us "fine bunch of people" — that couldn't attend Reston could afford to go to Dayton (or Hamburg, much-theless)? Need I say more?

If this is the best your magazine can do, then Mr. Cowan has a problem.

Edward W. Yoder, W3YMB
Linthicum Heights, MD

Editor,*CQ*:

Congratulations on your "Conventions and Hamfests" editorial in the November '75 issue! For too long, particularly in the affluent Hudson Division, ARRL officials have been insensitive to the economic crunch affecting so many of us.

It was with great pleasure I was reminded of the Dayton Hamvention. Once, when I was writing the RTTY Column for *CQ*, I was invited (by letter) to give a talk on RTTY at a Dayton Hamvention. Upon my acceptance I received (by letter) confirmation and tickets, including one for the banquet. There, in Dayton, all of us who were on the program were presented with tie clasps engraved with our call letters. It was a great pleasure to meet and talk there with such well-known hams as Bill Orr, Boyd Phelps and Walt Burdine. A wonderful time was had by everyone.

It was with less pleasure I was reminded of the time I was invited (by telephone) to make an RTTY presentation at a HARC-run Hudson Division Convention in New York City. A week before the scheduled date, I was informed (by telephone) that I was expected to buy my own tickets; and, lug in my own teletype machine!

I second your motion to "scrap the stuffy, formal, expensive and self-serving convention in favor of the enormously human Hamfest."

Byron H. Kretzman, W2JTP
Huntington, NY

Israeli QSL Cards

Editor, *CQ*:

Israel is not the only country whose Hams say, "My QSL fer sure", then never come through. After almost two years of Novice operating (I have WAS, WAC, and WPNX) I find that about 30% of all Hams refuse to QSL, even after receiving a SASE or SAE and IRC's, which I send to all DX. I consider QSLing part of the game, but unfortunately, many Hams refuse to play by the rules.

Tom Gannon, WN4HHJ
Mary Esther, FL

Cheyenne on 160 *(from page 31)*

the lower two bands. Both plates showed slight redness if the key was held down.

To reduce tube heating, the v.f.o. load inductance was changed from 8.5 μh to 56 μh. This makes little difference in the drive of 40 and up, since the original inductance was approximately resonated by circuit capacity on 40, but increases the drive on 80 and 160 about fourfold. The driver and buffer stages now run much cooler.

The v.f.o. output inductor is under the chassis, on the 3-lug terminal strip marked KK in the Heath manual. This strip is on the outside of the v.f.o. shield box above the two feedthrough capacitors.

For 160 m. operation put S_1 in the 160 m. position and the original bandswitch at 80. For other bands, set S_1 in the 80-10 position and the bandswitch to the desired band. Output frequency on 160 is half the 80 meter dial reading. That is, 1.8 MHz reads 3.6 MHz, 1.85 MHz reads 3.7 MHz, etc. Final drive level is set with the new drive level control after peaking the driver tuning (labelled Drive). To avoid damage to the final, keep its grid current between ½ and 4 ma at all times. High grid current can destroy a 6146. Best output comes at around 2 ma.

The toroid cores are available from Amidon Associates, 12033 Ostego St., North Hollywood, California 91607. All other parts are available from Newark Electronics, 500 N. Pulaski Rd., Chicago, Illinois 60624.

My thanks to W7FIQ for the photography and for suggestions on the manuscript. ■

We Don't Charge Nothin' *(from page 28)*

In fig. 9 is shown a further modification of the GP-21 circuit that offers user-choice of end-charge voltage. A National LM311H voltage comparator and 1N4104 voltage reference zener diode replace the fixed 12.8 volt zener in the original circuit. By adjusting the 2K trim-pot, and end-charge voltage from 12.5 to 14.5 volts may be selected. The polarity-reversal and output terminal short protection circuitry remain the same as in the original design.

The author has tried to give some of the basic concepts of battery charging, at least as they apply to common lead-acid cells and batteries. With the proliferation of gelled electrolyte lead-acid batteries, nickel-cadmium batteries and other types, there remain a number of other details to battery charging that have not been covered here. For each type of battery, each manufacturer has his own preferred charging recommendations. The references include several publications on these batteries and their charging recommendations, and on lead-acid batteries and their recommended charging. ■

References

Exide, "The Storage Battery (Lead-acid Types)," Section 50.10. Form 6750-3/69, Exide Power Systems Division, Exide Inc., Philadelphia, Pa. 19120.

Exide, "Chargers and Charging (For Lead-acid and Nickel-iron Batteries)," Section 57.00a, Form 6783-11/70-C, Exide Power Systems (above ref.).

Tektronix, "Nickel-Cadmium Review," Tektronix TEKscope, Aug. '69, p. 8-11 (Vol. 1, No. 4).

Gates, "Battery Application Manual," Gates Energy Products, Inc. 1050 S. Broadway, Denver, Colo. 80217. Belove, L., and McCarthy, J., "The Sealed Nickel-Cadmium Battery Cell," BA-112 Rev 667, Sonotone Batteries, Elmsford, N.Y. 10523

Motorola, "SCR Battery Charger," Section 8-5, Motorola Semi-conductor Circuits Manual, 1964.

Seeing It Like It Is *(from page 36)*

band. Of the four "receivers," the best combination of r.f. frequency response and output level is provided by the bipolar transistor depicted in (C). The base lead may be used for various control purposes. Present opto-couplers appear useable only for the low-frequency Ham bands, but the diode type shown in (A) should exhibit the best frequency response. It should not be too much of a trick for the producers of these devices to give us both, linearity and extended frequency-response. But, they are not yet convinced that there is a big market for Hams and hobbyists.

In any event, the v.f.o. shown in fig. 8 owes its derivation to the concerted efforts of both the philosopher and the technologist. The author suspects that good performance is potentially forthcoming from such a scheme. The Lambda diode has a low temperature coefficient, and the resonant tank should find itself in a near-ideal environment insofar as loading effects from its associated circuitry are concerned. Additional power boosting may be required, but that can be implemented in a straightforward way, and at the other end of a fairly-long

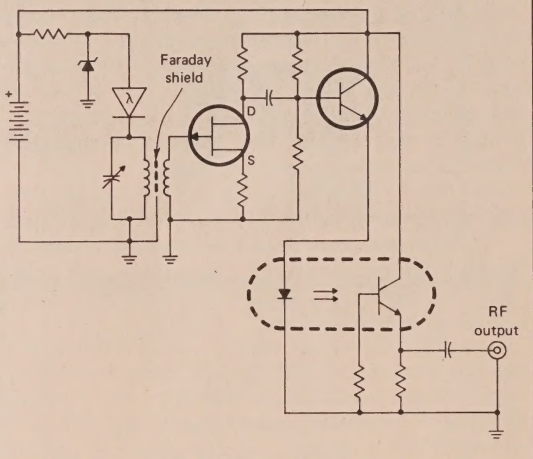

Fig. 8—A v.f.o. using the Lambda diode and the opto-isolator. Philosophically, this is a solid state version of the electron coupled vacuum tube oscillator. Here, the unilateral isolation of the load is accomplished with infra red radiation rather than with an electron beam.

coaxial cable, if so desired. Once in operation, a worthwhile experiment would be to ascertain how close to the ground end of the tank inductor the Lambda diode could be tapped down—such a technique should even further enhance the independence of the oscillating frequency.

Hopefully, some stimulation has been provided for seeking not merely novel, but actually *simpler* ways of doing things. One merely asks, "Now, what is really taking place here?" That is the philosophic contribution to endeavor. But some caution is called for—do not indulge in such unbridled introspection that may lead you to ask, "Now, *why* is this being done anway?" Because, you will then be invoking the *psychological* approach, which often culminates in fatalism, defeatism, and other isms of the most negative aspect. In order to maintain its

lofty position as overviewer of technological action and philosophical thought, the *psychological* approach claims that your reason for any decision is only a facade for the true impulses at work. This can be most disconcerting for the Ham who supposed that his hobby was presentable in anyone's parlor. It is illustrated only too well by the classic encounter between the two "shrinks" approaching one another on an otherwise-deserted sidewalk.

"Good morning," exclaimed the more extroverted of the two.

"Hmm," mused the other to himself, "Now, what could be the *meaning* behind such a remark?"

Of a certainty, no dismay will be felt by the author upon learning that the *philosophic* value of this article surpasses that of its humor! ■

Adding 20 meters to HW-16 *(from page 42)*

dicating that the oscillator is working. The r.f. coil is then adjusted for peak signal strength. The oscillator coil is then readjusted for peak signal strength and the adjustment is backed off a turn or two in the direction which produces the most reliable operation of the oscillator. The only additional adjustment necessary is to peak the padder in the driver plate circuit. With either a v.f.o. or crystal connected and the meter switched to "Rel Pwr," the "Tune" control is adjusted for maximum output without keeping the key down too long at any one time. Then the padder is adjusted for maximum output, completing the alignment.

The modified rig has been in use at WA6LSL for several months and has given a good account of itself. Power output on 20 meters is not quite as great as on 15 meters, probably because of the constants of the π-network, but it's ample to hold a good QSO. Those contemplating adding 10 meter coverage should include an extra switch section since the plate load of V_7, the oscillator, will have to be switched. On 10 meters, V_7 would double to 14 MHz and V_8 would double on to 28 MHz. ■

Calibration Control for HW-16 *(from page 43)*

signal, and adjust the receiver v.f.o. coil and tuning knob until the zero-beat of the calibrator signal coincides with the zero setting on the dial. The other two bands may now be zeroed by slight adjustments of the new calibrator capacitor. Dial accuracy may also be checked and corrected at any 100 kHz point on the dial using this new control. ■

CQ Reviews Tempo VHF/ONE *(from page 40)*

Conclusions

The Tempo VHF/ONE is a good performer on f.m. While I suspect it will also perform well on s.s.b., I must withhold judgement until tests have been run on the transceiver with the s.s.b. adaptor. The transceiver sells for $495.00. The s.s.b. adaptor is $225.00. Add to this an a.c. supply and you are in the neighborhood of $750.00. This makes the complete package with LED digital frequency display competitive in price with other units offering f.m., s.s.b. and a.c. supply in a single package, without LED digital display. It will be interesting to see which design approach proves the more popular. ■

Improving Atlas 180/210 *(from page 24)*

in and out of the i.f. chain with a d.p.d.t. relay. If the c.w. send/receive toggle switch previously described is installed, sufficient contacts would be made free on the function switch to control the relay. Thus with the function switch in "rec" one could work c.w. without the filter and in "CW" the c.w. filter would be switched in. The author has not tried internal mounting but it would appear that if the 1000 mf capacitor going to pin 2 of PC100 were moved to a vertical position, where it can be accommodated, sufficient space would be freed in that area for the circuit.

RF Filter in Keying Circuit

Several instances were noted in a portable situation where r.f. was coming back into the transceiver over the leads to a key and causing unstable keying. A .01 mf bypass and two ferrite beads mounted immediately on the key jack inside the transceiver took care of the problem.

Dial Cord Tension

After a period of some use it was noted that the tuning was developing some mild backlash. The simple cure for this problem was to carefully make one more turn of the dial string around the shaft of the gear reduction drive. This can be easily accessed by removing the bottom v.f.o. cover plate. Those who prefer a bit firmer feel to the tuning might want to do this.

External Antenna Switching

It might be useful to note that the bandswitch has one completely unused section in the v.f.o. enclosure. It could be used to switch different antennas, loading coils, etc. via relays on the different bands. Leads from the switch section could be brought out to unused pins on the "ext osc" or "aux" sockets.

The photos show a 210 unit with the front panel modified to include the s.w.r. sensitivity control on the left (between a.f. and r.f. gain) and the RIT tuning on the right (below mic. gain). The large size tuning knob (an old SP-600 knob) is just the author's preference for a knob with a heavier feel than the original Atlas knob. ■

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In Focus *(from page 51)*

happenings through to VE3LU on the u.h.f. channel. These Canadian chappies really put their equipment to work!

I'll bet there are some other fascinating goings-on out there among you latter day Marconis. How about dropping me a note and some pictures if you hear of a "good one"?

New Country On SSTV?

Sorry I had to put that question mark at the end of the line — but there's good news a-coming. The well known Ahmed Ebrahim, AP2AD of Pakistan is getting very anxious to get going on SSTV. At the request of Ted Cohen, W4UMF, I have mailed a sheaf of diagrams and slow scan information to Ahmed. Maybe one more for W8YEK's list?

Final-Final

As always, my thanks for your letters, cards, pictures, and feedback on these columns.

73, Bill, W2DD

Novice *(from page 55)*

SWW on the 80-meter Novice band. 73, Art, K8SWW."

Our personal view is that flipping on a kw amplifier to attract the attention of a Novice CQ-er using a cannon to kill a flea. By the way, Art works many Novices each December as ZF1AG. If you were one of them and still need the QSL card, send yours and a stamped reply envelope to Art's home address.

R. S. Maybaum, WA6NOQ, 430 Campbell Ave., San Francisco, Calif., 94134, started in amateur radio in 1919 with a spark transmitter but lost interest after a short time until the end of WW II. He has been active ever since and is currently on 40-meter c.w. and in the Navy Military Affiliate Radio System (MARS). He wishes that more old timers would help newcomers become radio amateurs. We hope that he practices what he preaches . . . **Preston Shute, WN4JTP,** 1025 Oak St., Dunedin, Fla., 33528, reports that K4BR/VP9, Bermuda, has been invading the Novice bands to work Novices. Preston worked him on 80 meters and already has his QSL card. A Heathkit HW-101 transceiver and an 80-40 meter dipole did the trick. Preston just finished building a Quad antenna from W6SAI's *Quad Antenna Handbook* and now wants to build a wire antenna with "gain" for 80 meters. If he has 320 feet available broadside to the directions he wishes to work, an "extended double zepp antenna" will give three db gain over a ½-wave dipole. Make the wire on each side of the center insulator 158 feet long. Feed the antenna in the center with 300-ohm TV feedline. Couple the line to the transceiver/transceiver via a balanced antenna coupler. Two-wire, air-insulated line is better than TV ribbon but more difficult to install . . . **Mark Austin, WA2UYL,** Corlis Park, Building 10, Apt. 3, Troy, N.Y. 12182, and **WB4-JSP/4** want to start a 40-meter phone net for amateurs who are also s.w.l's to exchange information. Of course, Novices could not transmit but could listen.

We are at the bottom of the page again! Send us your "News And Views," pictures, and suggestions of what you would like to see in your column. We will try to do the rest.

73, Herb, W9EGQ

DX *(from page 59)*

EA5AX—Via K1WPS
EA9FG—To Aridal 5, El Aiun, Spanish Sahara
FC2CD—c/o W4KA, Leo Haijsman, 1044 Southeast 43rd St., Cape Coral, FL 33904
FMØCGV—Via K4KGD
FPØMM—To WA1JKJ, 147 Lincoln St., Franklin, MA 02038
FYØBHI—c/o F2QQ
HKØBKX—Via WA6AHF
KG4BE—To Box 13, FPO, New York, N.Y. 09593
KL7PI—c/o Box 244, Yakutat, AL 99689
LU3AU—Via WA3HRV, P.O. Box 9622, Arlington, VA 22209
M1C—To I4EAT
P29UC—c/o WA7ILC
PE3NOS—Via PAØJR
PYØZAA—To WA3HRV, P.O. Box 9622, Arlington, VA 22209
VE1SU/SU—c/o VE1APY
VP2ABC—Via Box 444, Antigua
VP2DX (November, 1975 only)—To K4GKD
VP2LBH—c/o K2IGW
VP2MIR—Via W7FCD
VP2MKJ—To K4CKJ
VP2VAN—c/o K2FJ
VP5DF—Via K4VMA
VP5MD—To Rt. 1, Box 362B, Valrico, FL 33594
VR1AA—c/o Pack Kumagi, JA0CUV/1, Box 22, Mitaka, Tokyo, Japan
VR1Z—Via YASME Foundation, P.O. Box 2025, Castro Valley, CA 94546
VR8B and **VR8C**—To YASME Foundation, P.O. Box 2025, Castro Valley, CA 94546
VX9A—c/o VE3GMT
VYØA—Via VE3MJ
W5TES/KJ6—To W2GHK
WA3HRV/VP2D—c/o K4GKD
WB9AJF/6Y5—Via Box 38, Kingston 4, Jamacia or to W9 Bureau
ZK2AO—To Box 36, Niue Island, South Pacific
ZK2AP—c/o W0JRN
ZS6DN—Via WA4HHG
3AØFH—To WA3HRV
3D2AJ—c/o W6SC, 412 E. Arbor, Sunnyvale, CA 94086
3D6BE—Via P.O. Box 1158, Mbabane, Swaziland
3V8WO—To W4NJF
4U1ITU—For Oct. 25-26, 1975 contest operation only, cards go to Leo, W4KA, 1044 Southeast 43rd St., Cape Coral, FL 33904
5T5BJ—c/o Box 121, Zouerate, Mauritania
5T5GS—Via W6KTE
5X5NK—To DL1YW
7Q7LB—c/o IØDGB
9L1SL—Via P.O. Box 16, Freetown, Sierra Leone

73, John, K4IIF

Contest Calendar *(from page 63)*

countries (12) for their multiplier. Max. of 73. (Limit of 12 DX stations) Others use Fla. counties. (67)

Frequencies: C.W. — 1807, 3570, 7070, 14070, 21070, 28070. Phone— 1817, 3970, 7270, 14317, 21370, 28570.

Awards: Certificates, phone and c.w., to the top single operator score in each state, province and DX country, and each Florida county. There are also 5 trophies as follows: High single operator in Florida and out-of-state, phone and c.w., and to the Florida club with the highest aggregate score.

A summary sheet is requested showing the scoring and other pertinent information. Also your name and address in BLOCK LETTERS, and a signed declaration that all rules and regulations have been observed. Include a 13c stamp for issue of *Florida Skip* with the results.

Mailing deadline is April 30th to: Florida Skip Contest Committee, P.O. Box 501, Miami Springs, Florida 33166.

Polish DX Contest

Starts: 1500 GMT Saturday, April 3
Ends: 2400 GMT Sunday, April 4

It's the world working the SP's on all bands 3.5 thru 28 MHz c.w. only in this one.

There are three categories: Single operator, single and all band, multi-operator, all band only and s.w.l.

Exchange: RST plus a 3 figure QSO number starting with 001 for foreign stations. Polish stations will send RST and their powiat letters. (i.e. 579AB and etc.)

Scoring: Each QSO with a SP counts 3 points. Each different powait worked is a multiplier.

Final Score: Total QSO points multiplied by number of different powaits worked. The same station may be worked on each band for QSO points but a powait is counted only once.

Awards: Certificates to the top scorers in each category, in each continent, in each country and each call area of Australia, Canada, USA and USSR.

Contacts in this contest may be credited for the PZK 100 Powait award in lieu of QSL cards provided they are confirmed in the logs of the SP stations, and an application is made. Include a fee of 7 IRC's.

Use a separate sheet for each band and include a summary sheet with the scoring information and your name and address in Block Letters. The usual signed declaration is also requested. Disqualification rules for duplicate contacts and etc. will be enforced.

Entries must be postmarked no later than April 30th to: PZK Contest Committee, P.O. Box 320, 00-950 Warszawa, Poland. ■

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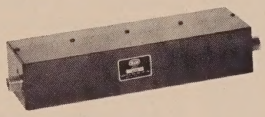

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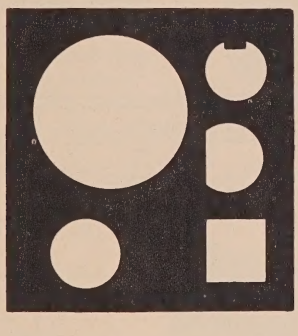

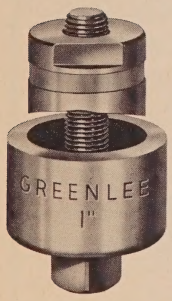

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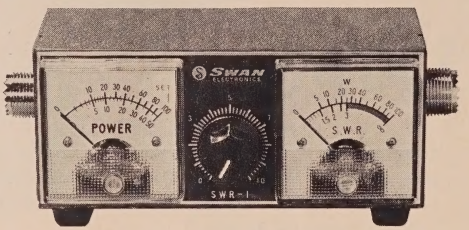

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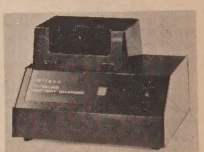

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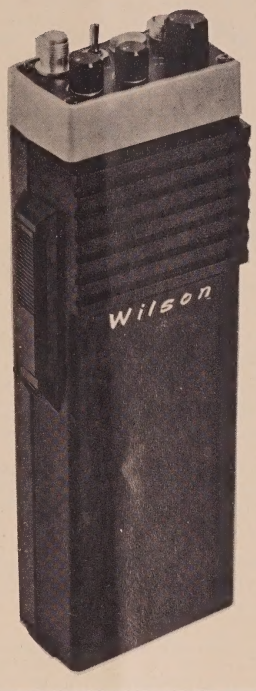

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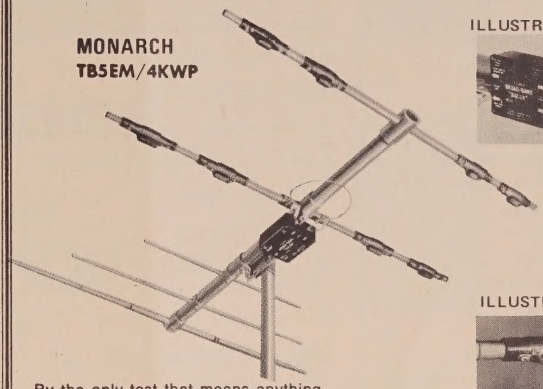

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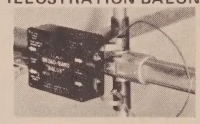

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Antennas *(from page 48)*

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"Well," I replied, "On the West Coast, there's quite a bit of interest in the so-called *Lazy Quad* loop. That's a single loop, either square or diamond in shape, placed parallel to the surface of the ground. The loop is a quarter wavelength on a side for the lowest frequency you intend to operate (fig. 7). For 80 meters, as an example, the loop is about 65 to 70 feet on a side. The actual shape of the loop isn't very important, as most fellows squeeze the wires about to fit the available space."

"How is the loop fed?" asked my friend.

"For low power—up to about 250 watts—most users employ TV "ribbon" line. Line length is relatively unimportant. For high power, TV "ladder line" is used. At the station end of the line, an antenna tuner is used, such as the one shown on pages 160-164 of my book, *"Wire Antennas for Radio Amateurs."*[1] That, plus an s.w.r. meter in the line from the transmitter to the tuner will do the job."

"Very well," said Pendergast, as he headed for the door. "I'll see you on 80 and 160 meters one of these days with a Lazy Quad antenna."

[1]*Available from Radio Publications, Inc., Box 149, Wilton, CN 06897. Price: $3.95 plus 25c postage and handling.*

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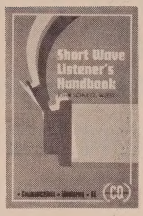

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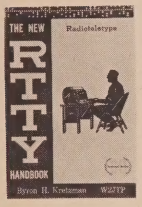

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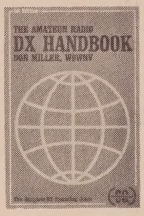

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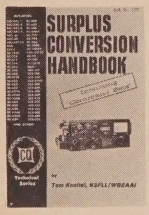

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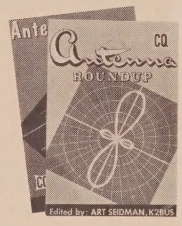

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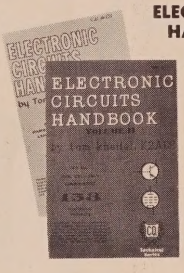

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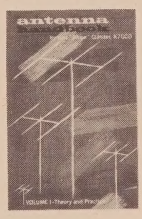

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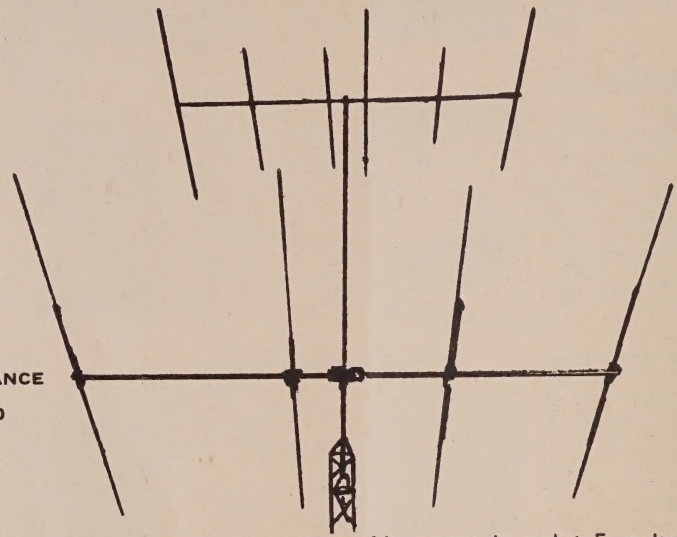

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